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VOL. VII

NUMERICAL ANALYSIS OF STIFFENED SHELLS OF REVOLUTION

Volume VII of VII

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16. ABSTRACT

This report contains user and programming information necessary for the application of the SATELLITE programs for the STARS system. The individual program functions are:

SAT-1S	Data debugging for the STARS-2S program.
SAT-2S	Fourier series conversion program.
SAT-1B	Data debugging for the STARS-2B program.
SAT-1V	Data debugging for the STARS-2V program.

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VOLUME I. Theory Manual for STARS-2S, 2B, 2V Digital Computer Programs

VOLUME II. Users' Manual for STARS-2S - Shell Theory Automated for Rotational Structures - 2 (Statics), Digital Computer Program

VOLUME III. Users' Manual for STARS-2B, 2V - Shell Theory Automated for Rotational Structures - 2 (Buckling, Vibrations), Digital Computer Programs

VOLUME IV. Engineer's Program Manual for STARS-2S - Shell Theory Automated for Rotational Structures - 2 (Statics), Digital Computer Program

VOLUME V. Engineer's Program Manual for STARS-2B - Shell Theory Automated for Rotational Structures -2 (Buckling), Digital Computer Program

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VOLUME VII. Satellite Programs for the STARS System

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INTRODUCTION

The STARS programs perform a significant amount of calculations prior to the complete processing of all data. Thus data errors or inconsistencies usually cause a run to terminate after the first data error is encountered. To overcome the resulting problem of requiring several computer runs to debug data, special data debugging packages called SAT-1S, SAT-1B, and SAT-1V were created for the STARS statics, stability, and vibrations programs respectively.

In the analysis of shells of revolution subjected to unsymmetric loads, the loading is often available as point intensities, whereas the analysis programs require Fourier series input. The SAT-2S program provides the necessary conversions. This program could have been incorporated into STARS but it was considered that the user should have additional freedom in specifying the series truncation points, and incremental summing options, all based upon his knowledge of the accuracy with which the loads were originally obtained.

The programs were written exclusively in FORTRAN IV for the IBM 370-165 computer, and then converted to the UNIVAC 1108. The core utilization of the programs is:

SAT-1S:	35,700 words of core
SAT-2S:	26,700 words of core
SAT-1B:	31,100 words of core
SAT-1V:	31,100 words of core

SECTION 1

SATELLITE-1S PROGRAM

1.1 INPUT: The sole purpose of the SAT-1( ) series of programs is data debugging of the appropriate STARS program input data decks. Therefore the input data is identical to that described for the STARS programs (Refs. 1,2), with one exception to be discussed below. For this purpose the dash separator cards, which are actually required only for data separation in the SATELLITE programs, are accepted also by the STARS programs.

The one data change involves the first card of the data deck, which in the STARS programs is an arbitrary alphanumeric card. For the SAT-1( ) series of programs this card is

I. Title Card	Column	Forma
A. Alphameric title (submission description)	1-60	15A4
B. Scale Extent	61-70	F10.0
This number will be used as the scale extent in the graphics output of the SATELLITE program. For example if the input number is 3000., the scale for all the diagrams will be set (square scale is used) so that 3,000.0 fits properly on 8 in. paper. A "default" option to this input is also available. If no scale extent is input, the program will size each region topology diagram on a square scale to best fit that region, resulting in different scales for different regions.		

All other input remains unchanged from the appropriate STARS program.

1.2 OUTPUT: The SAT-1( ) program functions basically are the following:

A. Check all STARS input data for consistency.

B. Check all STARS input data for possibilities of causing "divide by zero" errors.

C. Check shell idealizations by providing exact plots of input points and/or shapes, and topology, thus allowing the user to locate gaps or other types of errors.

D. Check spellings on alphameric clues, and where possible, format errors. In the latter case, no attempt has been made to override systems automatic terminations due to format inconsistencies. However, the use of the dash separator cards often allows further checking to proceed. The dash separator cards also overcome user errors in setting input table lengths.

Many of the errors encountered in the STARS data deck will not affect the idealization plotting capability of the SAT-1( ) programs. In cases where plotting is affected, as much plotting as possible will be accomplished before termination. Additional error messages will be provided directly on the charts.

1.3 EXAMPLES, FLOW CHART, LISTING: Two sample test problems are executed by the SAT-1S program. The first problem involves explicit input errors in a multi-harmonic submission, while the second test problem error is in idealization. The first problem errors are:

1. In the first segment, first region geometry table the following items are all zero: iso-grid spacing, the inner and outer sheet thicknesses of the basic sandwich shell wall, the core thickness of the basic sandwich shell wall.

2. The wall geometry clues are in error. There cannot be a ring in the meridional direction (first clue), and the second clue is misspelled.

3. In the second segment, first region geometry table the following items are all zero: waffle grid spacing, the inner and outer sheet thicknesses of the basic sandwich shell wall, the core thickness of the basic sandwich shell wall.

4. The second wall geometry clue for segment two, region one, is misspelled.

5. The joints for the intra-region link in region one are reversed.

6. In the first segment, second region geometry table the following items are all zero: K_{11}, K_{12}, K_{21}, K_{22}, K_{33}, D_{11}, D_{12}, D_{21}, D_{22}, and D_{33}.

7. The above error (item 6) is repeated in the second segment of the second region.

8. The structure kinematic link cards are reversed.

9. Because of the kinematic linking, the degrees of freedom of joints 1 and 2 must be "zeroed out". This run is obviously a fictitious test run since all joints cannot be "zeroed out", and thus joint 3 must have some degrees of freedom remaining.

10. The error count is printed as 63.

SATELLITE-1S

STARS-2S (STATICS) DATA DEBUGGING PROGRAM

VERSION DATE JULY 1, 1972

FOR INFORMATION CALL V. SVALBONAS

P. OGILVIE

```
MULTI-HARMONIC TEST PROBLEM                                          40.0
 2  4  1  3  1101
                                                                     NOTE - THIS IS AN INITIAL RUN. SAVE TAPES SAVE14 AND SAVE15.
                                                                     NOTE - GRAPHICS OUTPUT WILL BE PRODUCED.

                                                                     NOTE - NO INTERMEDIATE PRINTOUT WILL BE PROVIDED.
     0.    1.    2.
STEEL     STIF
     .0000000    -.1000000+02   .2000000+02   .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .3000000+08  .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .3000000+08  .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .2000000+00  .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .1250000-05  .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .1250000-05  .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .1250000+08  .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000
     .0000000     .0000000      .0000000      .0000000    .0000000

 2 1   1 REGION  > 2 SEGMENTS
   1   1   2
21 FIRST PART OF REG. NO. 1
 3.250  E+01  1.0  E+04  .125  E+01
 0.0
STIF   STEEL   BLAN   ISG3   NOTHERMAL 0.0   LINE   2
     .3402391+00  .5105088+00
     .0000000     .0000000
     .0000000     .0000000
     .0000000     .0000000
     .0000000     .0000000
     .0000000     .0000000
     .0000000     .0000000
     .0000000     .0000000
     .0000000     .0000000

 THE ISO-GRID SPACING IS ZERO.
```

• REGION NUMBER 1 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE OUTSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE CORE THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE INSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE ISO-GRID SPACING IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE OUTSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE CORE THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE INSIDE SHEET THICKNESS IS ZERO.

```
    •   REGION NUMBER  1     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2   •

000100
    .2000000+04    .2000000+04
RING      STII        SHEL        SHEL
   THE STRESS CLUE FOR PHI INNER IS NOT STRI, SHEL, ISGR, OR WAFF.

    •   REGION NUMBER  1     SEGMENT NUMBER  1   •

   THE STRESS CLUE FOR PHI OUTER IS NOT STRI, SHEL, ISGR, OR WAFF.

    •   REGION NUMBER  1     SEGMENT NUMBER  1   •

    .0000000       .0000000
    .0000000       .0000000
     1    1    2
-------------------------------------------------------------------------------

11 SECOND PART OF REG. NO.1
 0.01      E 00 1.0       E-04 1.7017   E-03                              0.
 56.3           1.0
STIF      STEEL      BLAN      RWA3       THST      0.0       LINEAR      2
    .1701696+00    .3403392+00
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
   THE WAFFLE GRID SPACING IS ZERO.

    •   REGION NUMBER  1     SEGMENT NUMBER  2     SEGMENT GEOMETRY TABLE ITEM  1   •

   THE OUTSIDE SHEET THICKNESS IS ZERO.

    •   REGION NUMBER  1     SEGMENT NUMBER  2     SEGMENT GEOMETRY TABLE ITEM  1   •
```

THE CORE THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE INSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE WAFFLE GRID SPACING IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE OUTSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE CORE THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE INSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

```
400100
 .0000000    .0000000
 .0000000    .0000000
 .0000000    .0000000
 .0000000    .0000000
 .2000000+04 .2000000+04
```

STRI STII SHEL SHEL

THE STRESS CLUE FOR PHI OUTER IS NOT STRI, SHEL, ISGR, OR WAFF.

• REGION NUMBER 1 SEGMENT NUMBER 2 •

.0000000 .0000000
.0000000 .0000000
2 2 3

---

1 2 1.0

FOR KINEMATIC LINKS BETWEEN SEGMENTS, THE DEPENDENT JOINT NUMBER MUST BE GREATER THAN THE INDEPENDENT JOINT NUMBER.

---

2 0 1 REGION > 2 SEGMENTS
2 2 3
11 FIRST PART OF REG. NO. 2
0.01 E 00 1.0 E-04 1.7017 E-03 0.
56.3 1.0
STIF STEEL BLAN STIO NOTH 0.0 LINEAR 2
.3483392+00 .5105088+00
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000

THE K11 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K12 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K21 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K22 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K33 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D11 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D12 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D21 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D22 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D33 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K11 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K12 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K21 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K22 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K33 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE D11 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

```
THE D12 STIFFNESS PARAMETER IS ZERO.

    •   REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2   •

THE D21 STIFFNESS PARAMETER IS ZERO.

    •   REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2   •

THE D22 STIFFNESS PARAMETER IS ZERO.

    •   REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2   •

THE D33 STIFFNESS PARAMETER IS ZERO.

    •   REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2   •

000100
    .2000000+04   .2000000+04
    1    1    2
------------------------------------------------------------------------------------

11 SECOND PART OF REG. NO.2
 0.01     E 00 1.0     E-04 1.7017   E-03                          0.
 56.3          1.0
STIF      STEEL     BLAN      RWAF      NOTH      0.0     LINEAR     2
    .5105088+00   .6806784+00
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
    .0000000      .0000000
THE K11 STIFFNESS PARAMETER IS ZERO.
```

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K12 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K21 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K22 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K33 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D11 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D12 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D21 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D22 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE D33 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE K11 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K12 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K21 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K22 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE K33 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE D11 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE D12 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE D21 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE D22 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE D33 STIFFNESS PARAMETER IS ZERO.

• REGION NUMBER 2 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

000100
•2000000+04 •2000000+04
2 2 3

3 0 2
2 3 1.0
1 3 1.0

J-TH JOINTS ON SUCCESSIVE INTER-REGION KINEMATIC LINK CARDS MUST BE IN INCREASING ORDER.

1 1 0 3 00.101

DEGREES OF FREEDOM OF DEPENDENT (J) JOINT OF KINEMATIC LINKS MUST BE 'ZEROED OUT'.

2 1 1 1 1

DEGREES OF FREEDOM OF DEPENDENT (J) JOINT OF KINEMATIC LINKS MUST BE 'ZEROED OUT'.

3 0 0 0 0

000100 2

.2000000+04 .2000000+04

400100 2

.0000000 .0000000

.0000000 .0000000

.0000000 .0000000

.0000000 .0000000

.2000000+04 .2000000+04

000100 2

.2000000+04 .2000000+04

000100 2

.2000000+04 .2000000+04

000100 2

.2000000+04 .2000000+04

400100 2

.0000000 .0000000

.0000000 .0000000

.0000000 .0000000

.0000000 .0000000

.2000000+04 .2000000+04

000100 2

.2000000+04 .2000000+04

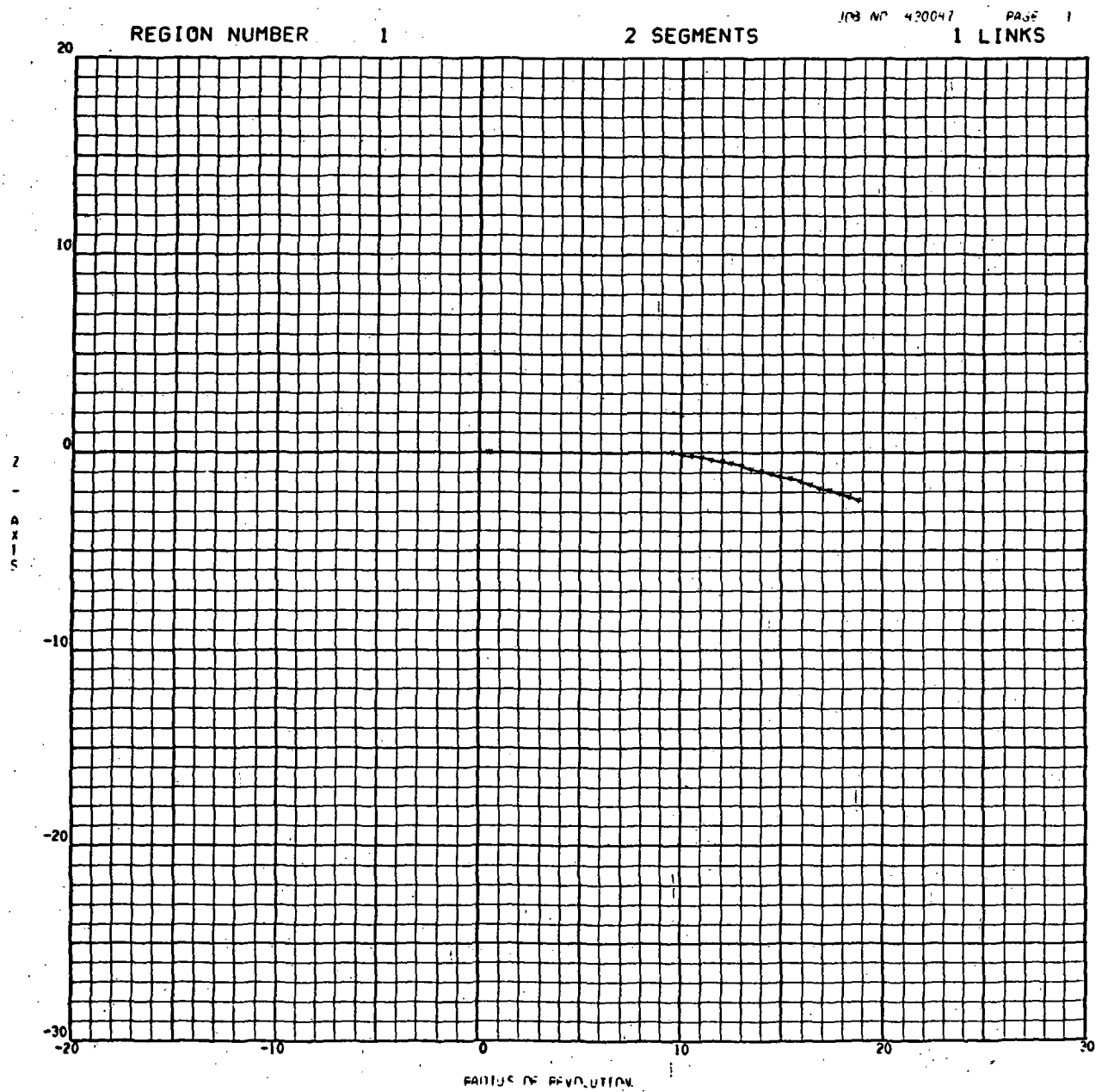
000100 2

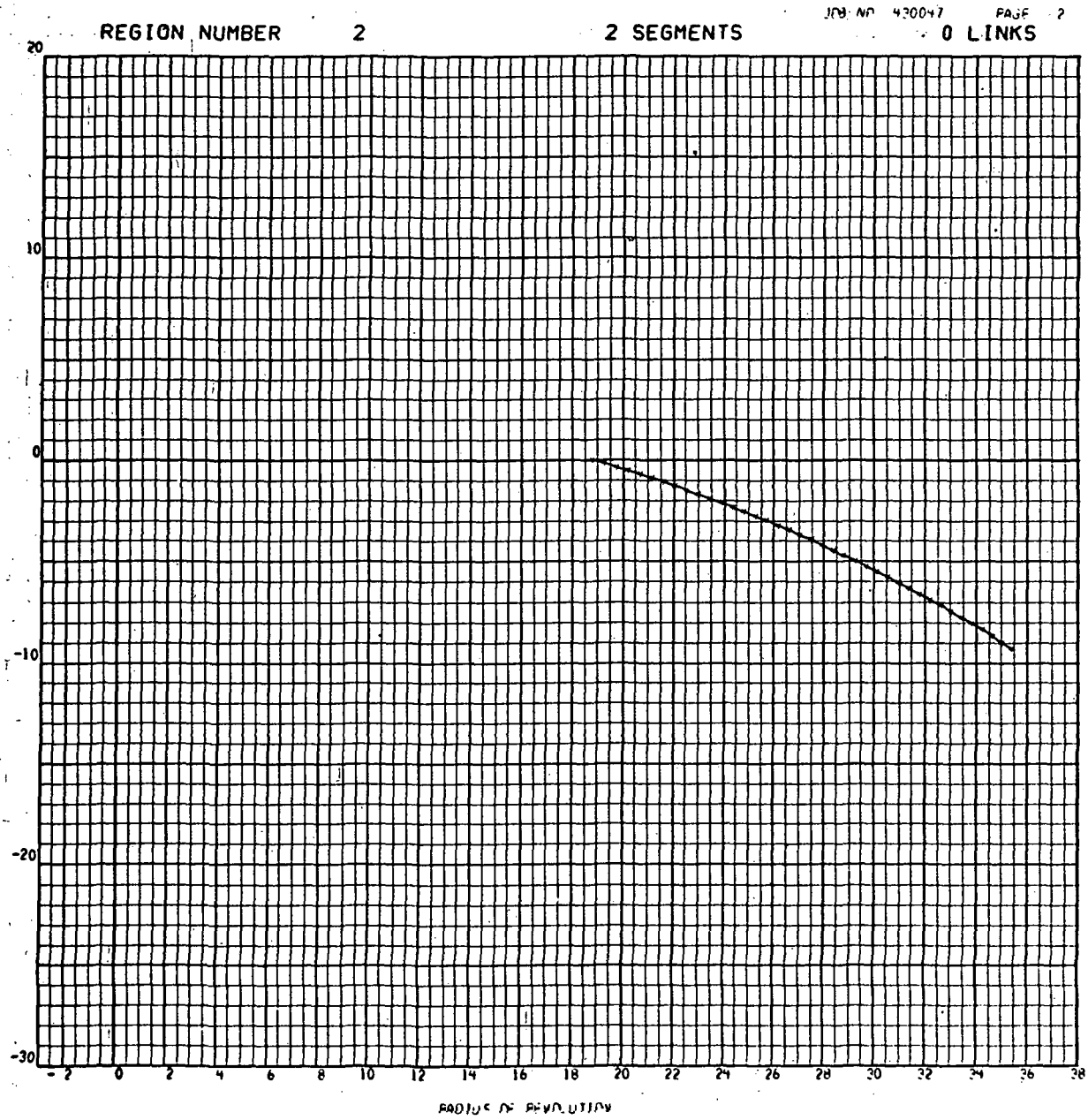
.2000000+04 .2000000+04

8

•0000000 •7854000+00 •1570800+01 •2356200+01 •3141600+01
•3927000+01 •4712400+01 •5497800+01

63 ERRORS LOCATED.


JOB NO 430047 PAGE 1
REGION NUMBER 1
2 SEGMENTS
1 LINKS
20
10
0
-10
-20
-30
-20
-10
0
10
20
30
Z - AXIS
RADIUS OF REVOLUTION


JOB NO 430047 PAGE 2
REGION NUMBER 2
2 SEGMENTS
0 LINKS
20
10
0
-10
-20
-30
-2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38
RADIUS OF REVOLUTION

The second problem has no detectable error printout. However, inspection of the graphical display of the idealization shows an unintentional wrinkle put in by the point input geometries. This means that the z, r tables were acceptable to the program, but not correct for the representation of a smooth, toroidal-like shape. This type of input error would not cause the STARS program to interrupt execution, but would produce an analysis of the wrong structure.

SATELLITE-1S

STARS-2S (STATICS) DATA DEBUGGING PROGRAM

VERSION DATE JULY 1, 1972

FOR INFORMATION CALL V. SVALBONAS

P. OGILVIE

```
 GRAPHICS  TOPOLOGY  TEST
 1  5  1  1  11  1  1

                                                    NOTE - THIS IS AN INITIAL RUN. SAVE TAPES SAVE14 AND SAVE15.
                                                    NOTE - GRAPHICS OUTPUT WILL BE PRODUCED.

                                                    NOTE - NO INTERMEDIATE PRINTOUT WILL BE PROVIDED.

   0.
ALUM       ISOT
   .0000000       .0000000       .0000000       .0000000       .0000000
   .0000000       .0000000       .0000000       .0000000       .0000000
   .3000000+07    .0000000       .0000000       .0000000       .0000000
   .0000000       .0000000       .0000000       .0000000       .0000000
   .3000000+00    .0000000       .0000000       .0000000       .0000000
   .0000000       .0000000       .0000000       .0000000       .0000000
   .0000000       .0000000       .0000000       .0000000       .0000000
   .0000000       .0000000       .0000000       .0000000       .0000000
-------------------------------------------------------------------------------

 5 4 0
    1    1    2
148
  .5          1.0      E-04     .1                                        0.
 7     .0000   18.5000    3.5000   19.5000    7.0000   18.5000   11.5000
   15.5000   14.5000   11.5000   15.6000    7.5000   17.0000    1.0000
ISOT       ALUM       SING       THIC       NOTH        0.0       LINE        2
   .2000000+00    .1250000+01
   .1000000+01    .1000000+01

    1    1    2
-------------------------------------------------------------------------------

148
  .5          1.0      E-04     .1                                        0.
 7     .0000   19.0000    3.5000   20.0000    7.0000   19.0000   11.5000
   16.0000   14.5000   12.0000   15.6000    8.0000   17.0000    1.0000
ISOT       ALUM       SING       THIC       NOTH        0.0       LINE        2
   .1250000+01    .1570800+01
   .1000000+01    .1000000+01

    2    3    4
-------------------------------------------------------------------------------

21
  .1          1.0      E-04     .01                                       0.
 -1.0
ISOT       ALUM       SING       THIC       NOTH        0.0       LINE        2
   .2100000+02    .3100000+02
   .1000000+01    .1000000+01
```

```
   3    6    5
-----------------------------------------------------------------------

21
 .1              1.0       E-04      .01                                  0.
-1.0
ISOT       ALUM       SING       THIC       NOTH          0.0       LINE        2
  .11000000+02    .21000000+02
  .10000000+01    .10000000+01

   4    8    7
-----------------------------------------------------------------------

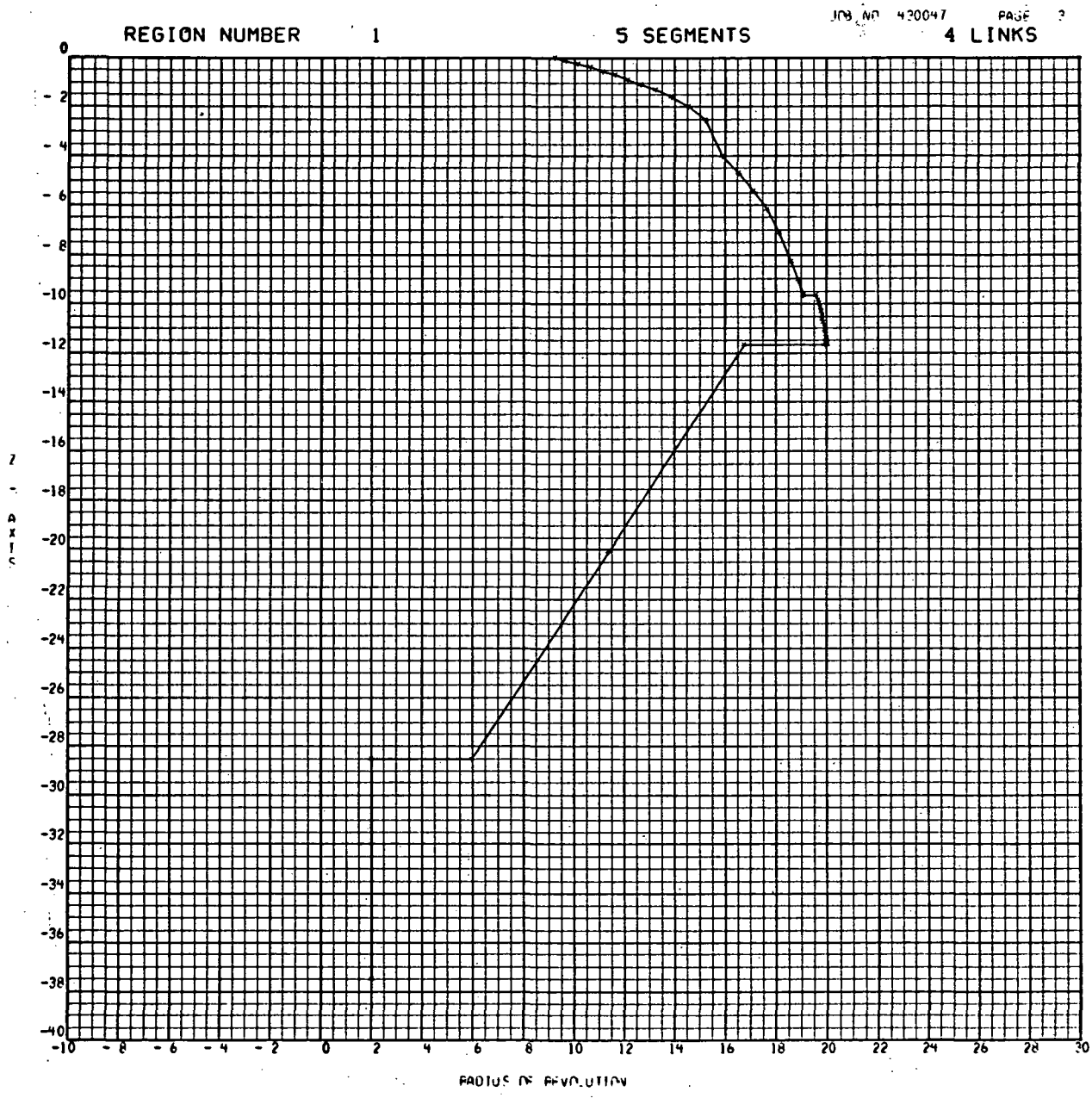
31 CYL.
  .5             1.0       E-04      .1                                   0.
  2.0
ISOT       ALUM       SING       THIC       NOTH          0.0       LINE        2
  .10000000+01    .10000000+02
  .10000000+01    .10000000+01

   5    9   10
-----------------------------------------------------------------------

3 2  1.5708
5 4  4.71239
7 6  4.71239
9 8  4.71239
-----------------------------------------------------------------------

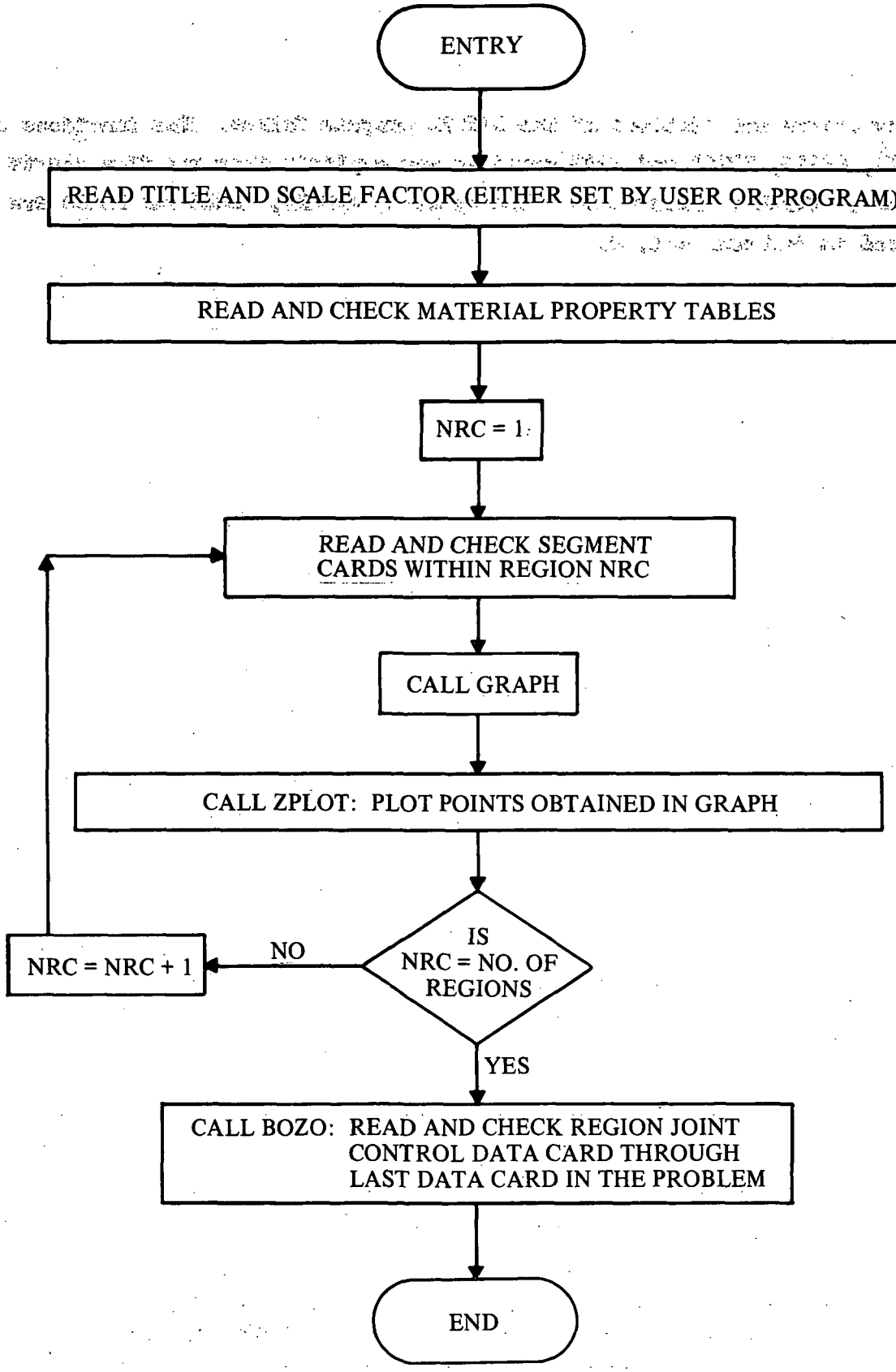
   2    0    0
1 0 0 0 0
2 1 1 1 1
-----------------------------------------------------------------------
```

NO DETECTABLE ERRORS FOUND.

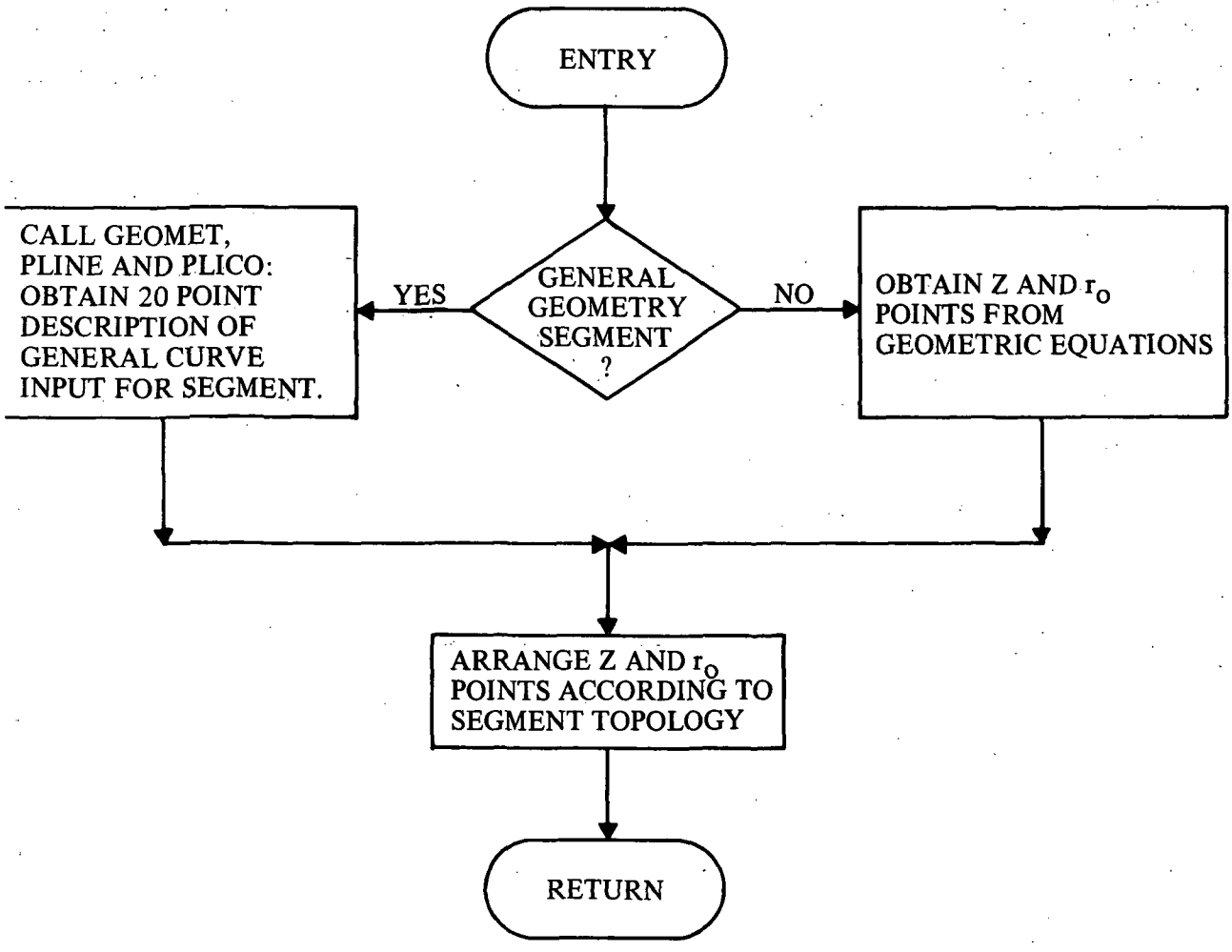

JOB NO 420047 PAGE 3
REGION NUMBER 1
5 SEGMENTS
4 LINKS
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
Z - AXIS
-10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
RADIUS OF REVOLUTION

The flow charts and listings of the SAT-1S program follow. The functions of the MAIN, GRAPH, ZPLOT and BOZO routines are explicit from the flow charts and need no further elaboration. The routines GEOMET, PLINE and PLICO are discussed in References 1, 2.

MAIN


ENTRY
READ TITLE AND SCALE FACTOR (EITHER SET BY USER OR PROGRAM)
READ AND CHECK MATERIAL PROPERTY TABLES
NRC = 1
READ AND CHECK SEGMENT CARDS WITHIN REGION NRC
CALL GRAPH
CALL ZPLOT: PLOT POINTS OBTAINED IN GRAPH
IS NRC = NO. OF REGIONS
NO
NRC = NRC + 1
YES
CALL BOZO: READ AND CHECK REGION JOINT CONTROL DATA CARD THROUGH LAST DATA CARD IN THE PROBLEM
END

GRAPH


ENTRY
GENERAL GEOMETRY SEGMENT ?
YES
NO
CALL GEOMET, PLINE AND PLICO: OBTAIN 20 POINT DESCRIPTION OF GENERAL CURVE INPUT FOR SEGMENT.
OBTAIN Z AND r_o POINTS FROM GEOMETRIC EQUATIONS
ARRANGE Z AND r_o POINTS ACCORDING TO SEGMENT TOPOLOGY
RETURN

```
RUN,//T STARSS,430047,KEYJØHBIN214,1,500
ASG,T PUR,T,SAVE05
FREE TPF$.
ASG,T TPF$,F/1/PØS/10
FØR,IS BLDATA,BLDATA
      BLØCK DATA
      CØMMØN/NAM1/FACE(4),STRGØ(7),THERM(4),EQUATE(3),
     1            STRESS(5),MATER(3),SEGTAB(12)
      DATA FACE/4HSING,4HEQUA,4HUNEQ,4HBLAN/
      DATA STRGØ/11.0,13.0,21.0,31.0,12.0,14.0,15.0/
      DATA THERM/4HTHST,4HNØTH,4HTHCN,4HTHIN/
      DATA MATER/4HISØT,4HØRTH,4HSTIF/
      DATA SEGTAB/4HST10,4HTHIC,4HRWAF,4HRWA1,4HRWA2,4HRWA3,4HISG1,
     1            4HISG2,4HISG3,4HST11,4HST12,4HST13/
      DATA EQUATE/4HLINE,4HØMTH,4HNPHI/
      DATA STRESS/4HRING,4HSTRI,4HSHEL,4HWAFF,4HISGR/
      END
FØR,IS MAIN,MAIN
C
C     ********************************************************************
C     *                                                                  *
C     *                          SATELLITE-1S                            *
C     *                                                                  *
C     *                    DATA DEBUGGING PRØGRAM                        *
C     *                          FØR                                     *
C     *                      STARS-2S (STATICS)                          *
C     *                                                                  *
C     ********************************************************************
C
      INTEGER SAVJTC,SAVSTP,SEGTAB,THICK,TYPE
      INTEGER*2 NXMAT,LST,KELV,LAYR,NPS
      CØMMØN/NAM1/FACE(4),STRGØ(7),THERM(4),EQUATE(3),
     1            STRESS(5),MATER(3),SEGTAB(12)
      CØMMØN/GRAPHS/STIC(30),STP(30),GG1(30),GG2(30),GG3(30),
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NSKL ,
     2JJT(30),IJT(30)
      CØMMØN /GPLØT/ ZZ(600),RRAD(600),NPT,NZR,DX
      CØMMØN /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,
     1                PØLY(10),NCØEF
      CØMMØN NERRØR,ICØUNT,XMAT(110,10),NXMAT(20),ST(70,31),DUM(20),
     1       KELV(900),LAYR(900),NPS(900),NHAR,NSMAX,NMPT,NGRAPH,LST(61)
      DIMENSIØN XDUM(6),JCHK(30)
      DIMENSIØN STD(10),HARM(25),IHCLUE(2),VAR(4),KLUE(4)
      DIMENSIØN NRZN(30),ZJ(14,30),RJ(14,30)
      DIMENSIØN ANGL(30)
      EQUIVALENCE (DUM(1),D)
      DATA DLIMTR/4H----/,A/1HA/,B/1HB/
2000 FØRMAT(20A4)
2001 FØRMAT(1X,20A4)
      IREGC = 1
    1 READ(5,1999,END=555) DX,DUM
1999 FØRMAT(60X,E10.0,T1,20A4)
      WRITE(6,1901)
1901 FØRMAT(1H1,20(/),60X,12HSATELLITE-1S////46X, 41HSTARS-2S (STATICS)
     1 DATA DEBUGGING PRØGRAM////52X,27HVERSIØN DATE   JULY 1, 1972,
     2  25(/),80X,35HFØR INFØRMATIØN CALL   V. SVALBØNAS/117X,148(516) 5
     375-7701/103X,10HP. ØGILVIE)
      WRITE(6,1726)
1726 FØRMAT(1H1)
      WRITE(6,2001) DUM
      READ(5,1111) NREG,NSMAX,NMPT,NHAR,NPRØB,NCUPLE,IHCLUE,NGRAPH,DUM
```

```
1111 FØRMAT(I2,I3,3I2,3I1,I2,T1,20A4)
     WRITE(6,2001) DUM
     IF (IHCLUE(1).EQ.0) WRITE(6,1400)
1400 FØRMAT(60X,-NØTE - THIS IS AN INITIAL RUN. SAVE TAPES SAVE14 AND S
    1AVE15.-/)
     IF (IHCLUE(1).EQ.1) WRITE(6,1401)
1401 FØRMAT(60X,-WARNING - THIS IS A RESTART RUN. MØUNT RESTART TAPE AS
    1 LØGICAL UNIT 15.-/)
     IF (NGRAPH.EQ.0) WRITE(6,1503)
1503 FØRMAT(60X,-NØTE - THERE WILL BE NØ GRAPHICS ØUTPUT.-/)
     IF (NGRAPH.NE.0) WRITE(6,1504)
1504 FØRMAT(60X,-NØTE - GRAPHICS ØUTPUT WILL BE PRØDUCED.-/)
     IF (IHCLUE(2).EQ.0) WRITE(6,1402)
1402 FØRMAT(/60X,-NØTE - INTERMEDIATE PRINTØUT WILL BE PRØVIDED.-/)
     IF (IHCLUE(2).EQ.1) WRITE(6,1403)
1403 FØRMAT(/60X,-NØTE - NØ INTERMEDIATE PRINTØUT WILL BE PRØVIDED.-/)
     IF (NHAR.GT.1.AND.NPRØB.GT.1.AND.NCUPLE.EQ.1) GØ TØ 8900
     GØ TØ 689
8900 CØNTINUE
     NERRØR = 45
     CALL ETRAP
     KLUT = 1
 689 CØNTINUE
     IF (NHAR.GE.1.AND.NHAR.LE.25) GØ TØ 2200
     NERRØR = 47
     CALL ETRAP
     WRITE(6,223)
     GØ TØ 2
2200 CØNTINUE
     READ(5,1002) (HARM(J),J=1,NHAR)
1002 FØRMAT(16F5.0)
     WRITE(6,1208) (HARM(J),J=1,NHAR)
1208 FØRMAT(1X,16F5.0)
     NLCASE = NPRØB
     NIX = 0
     ICØUNT = 0
     NHARM = 1
     XN = HARM(1)
     NRØW = 0
     KK = -1
     NSAVE = 0
     DØ 13 I=1,NMPT
     KK = KK+2
     NXMAT(KK) = NRØW+1
     II = NRØW+1
     READ(5,1004) STD(I),TYPE,DUM
1004 FØRMAT(2(A4,6X),T1,20A4)
     WRITE(6,2001) DUM
     NRØW = 11
     DØ 11 L=1,3
  11 IF (TYPE.EQ.MATER(L)) GØ TØ 12
     NERRØR = 1
     CALL ETRAP
     STD(I) = DLIMTR
     WRITE(6,223)
 223 FØRMAT(28X,103H*   DUE TØ INPUT ERRØR IT IS IMPØSSIBLE TØ CHECK TH
    1E FØLLØWING CARDS UP TØ THE DASH-SEPARATØR CARD.   */)
     GØ TØ 2
  12 CØNTINUE
     IF (L.EQ.1) NRØW = 4
     IF (L.EQ.2) NRØW = 7
```

```
      LLL = NSAVE+NRØW
      READ(5,1005) ((XMAT(M,J),J=1,10),M=II,LLL)
 1005 FØRMAT(5E14.7)
      WRITE(6,1205) ((XMAT(M,J),J=1,10),M=II,LLL)
 1205 FØRMAT(1X,5E14.7)
      DØ 608 M=3,10
      IF (XMAT(II,M-1).LT.XMAT(II,M)) GØ TØ 608
      IF (XMAT(II,M).EQ.0.0) GØ TØ 608
      NERRØR = 32
      CALL ETRAP
      STD(I) = D
  608 CØNTINUE
      NRØW = NSAVE+NRØW.
      NXMAT(KK+1) = LLL
   13 NSAVE = NRØW
    2 READ(5,2000) DUM
      WRITE(6,2001) DUM
      IF (D.NE.DLIMTR) GØ TØ 2
      WRITE(6,222)
  222 FØRMAT(/)
      NSG = 0
      DØ 99 NRC=1,NREG
      READ(5,1003) NST,NKL,NRING,DUM
 1003 FØRMAT(3I2,T1,20A4)
      WRITE(6,2001) DUM
      IF (NRING.LE.28) GØ TØ 214
      NERRØR = 53
      CALL ETRAP
      WRITE(6,996) NRC
  996 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,-   *-///)
  214 CØNTINUE
   15 IF (NCUPLE.EQ.0) GØ TØ 18
      READ(5,1006) IRR,JRTIC,JRSTØP,DUM
 1006 FØRMAT(3I5,T1,20A4)
      WRITE(6,2001) DUM
      IR = IRR
   18 NSEG = NST
      NSC = 0
  101 NSC = NSC+1
      NSG = NSG+1
      NCHK = 0
      READ(5,1011) RGØ,ANG,DUM
 1011 FØRMAT(F2.0,A1,T1,20A4)
      WRITE(6,2001) DUM
C     GEØMETRY IDENTIFICATIØN SEARCH
      DØ 504 I=1,7
  504 IF (RGØ.EQ.STRGØ(I)) GØ TØ 505
      NERRØR = 2
      NCHK = 1
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  999 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,-   *-
     1       ///)
  505 KGEØM = I
      MGEØM(NSC) = KGEØM
      IF (KGEØM.EQ.5) WRITE(6,1233)
 1233 FØRMAT(/60X,-NØTE - FØR PLØT RØUTINE A/B=1.5, N=0 WILL BE USED.-/)
      IF (RGØ.NE.14.0) GØ TØ 280
      ANGL(NSC) = ANG
      IF (ANG.EQ.A.ØR.ANG.EQ.B) GØ TØ 280
      NERRØR = 2
```

```
      NCHK = 1
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  280 CØNTINUE
      READ(5,1012) DTAU,DIFF,STEP,DELTA,DUM
 1012 FØRMAT(3E14.1,28X,F2.0,T1,20A4)
      WRITE(6,2001) DUM
      IF (RGØ.EQ.14.0) GØ TØ 180
      READ(5,1015) G1,G2,G3,DUM
 1015 FØRMAT(3E14.1,T1,20A4)
      WRITE(6,2001) DUM
      GG1(NSC) = G1
      GG2(NSC) = G2
      GG3(NSC) = G3
      GØ TØ 188
  180 READ(5,182) NRZIN,(ZI(J),RI(J),J=1,3),ZI(4),DUM
  182 FØRMAT(I2,7F10.0,T1,20A4)
      NRZN(NSC) = NRZIN
      IF (NRZIN.LE.14) GØ TØ 181
      WRITE(6,2001) DUM
      NERRØR = 55
      NCHK = 1
      CALL ETRAP
      WRITE(6,223)
      GØ TØ 3
  181 IF (NRZIN.LE.3) GØ TØ 185
      IF (NRZIN.EQ.4) READ(5,186) RI(4)
  186 FØRMAT(7F10.0)
      IF (NRZIN.GT.4) READ(5,186) RI(4),(ZI(J),RI(J),J=5,NRZIN)
  185 CØNTINUE
      WRITE(6,183) NRZIN,(ZI(J),RI(J),J=1,NRZIN)
  183 FØRMAT(1X,I2,7F10.4/(1X,7F10.4))
      DØ 190 J=1,NRZIN
      ZJ(J,NSC) = ZI(J)
  190 RJ(J,NSC) = RI(J)
  188 CØNTINUE
      READ(5,1013) TYPE,HLAYR,SHEET,INTERP,RANKIN,TEFREE,ANALYS,NP,DUM
 1013 FØRMAT(5(A4,6X),E10.1,A4,6X,I2,T1,20A4)
      WRITE(6,2001) DUM
      ICHK = 0
      KLUT = 0
      XNL = 0.0
C     MATERIAL PRØPERTY IDENTIFICATIØN
      DØ 501 I=1,NMPT
  501 IF (HLAYR.EQ.STD(I)) GØ TØ 502
      NERRØR = 4
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      ICHK = 2
  502 MAT = I
      LAYR(NSG) = MAT
      DØ 506 I=1,3
  506 IF (TYPE.EQ.MATER(I)) GØ TØ 507
      NERRØR = 5
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  507 ITYPE = I
      DØ 510 I=1,12
  510 IF (INTERP.EQ.SEGTAB(I)) GØ TØ 511
      NERRØR = 6
      CALL ETRAP
```

```
      WRITE(6,999) NRC,NSC
      ICHK = 1
  511 ISTTAB = I
      KLUE2 = 1
      IF (ISTTAB.GE.3.AND.ISTTAB.LE.6) KLUE2 = 2
      DØ 508 I=1,4
  508 IF (SHEET.EQ.FACE(I)) GØ TØ 509
      NERRØR = 7
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      ICHK = 1
  509 THICK = I
C     TEMPERATURE LØAD IDENTIFICATIØN
      DØ 401 I=1,4
  401 IF (RANKIN.EQ.THERM(I)) GØ TØ 402
      NERRØR = 8
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      I = 5
  402 KELVIN = I
      IF (NPRØB.GT.1.AND.KELVIN.NE.2) GØ TØ 408
      GØ TØ 409
  408 NERRØR = 38
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  409 CØNTINUE
C     LINEAR ØR NØN-LINEAR ANALYSIS IDENTIFICATIØN
      DØ 403 I=1,3
  403 IF (EQUATE(I).EQ.ANALYS) GØ TØ 404
      NERRØR = 36
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      KLUT = 1
  404 IANLYZ = I
      IF (IANLYZ.EQ.1.ØR.NHAR.LE.1) GØ TØ 7001
      NERRØR = 46
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      KLUT = 1
 7001 IF (IANLYZ.EQ.1.ØR.NPRØB.LE.1) GØ TØ 7002
      NERRØR = 37
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      KLUT = 1
 7002 IF (IANLYZ.NE.1) XNL = 1.0
      IF (XNL.EQ.0.0.ØR.XN.EQ.0.0) GØ TØ 7003
      NERRØR = 40
      CALL ETRAP
      WRITE(6,999) NRC,NSC
 7003 CØNTINUE
      NPS(NSG) = NP
      IF (NP.GE.2.AND.NP.LE.30) GØ TØ 191
      NERRØR = 3
      NCHK = 1
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      WRITE(6,223)
      NPS(NSG) = 31
      GØ TØ 3
  191 CØNTINUE
      IF (ICHK.EQ.1) WRITE(6,223)
```

```
      IF (ICHK.EQ.1) GØ TØ 3
      NRØW = THICK+1
      IF (ISTTAB.EQ.1) NRØW = 11
      IF (ISTTAB.EQ.3) NRØW = 13
      IF (ISTTAB.EQ.4) NRØW = 7
      IF (ISTTAB.EQ.5) NRØW = 8
      IF (ISTTAB.EQ.6) NRØW = 9
      IF (ISTTAB.EQ.7) NRØW = 7
      IF (ISTTAB.EQ.8) NRØW = 8
      IF (ISTTAB.EQ.9) NRØW = 9
      IF (ISTTAB.EQ.10) NRØW = 12
      IF (ISTTAB.EQ.11) NRØW = 13
      IF (ISTTAB.EQ.12) NRØW = 14
      DØ 901 I=1,NRØW
      READ(5,1005) (ST(I,J),J=1,NP)
      WRITE(6,1205) (ST(I,J),J=1,NP)
  901 CØNTINUE
      STIC(NSC) = ST(1,1)
      STP(NSC) = ST(1,NP)
      IF (G1.EQ.0.0.AND.KGEØM.EQ.3) GØ TØ 902
      GØ TØ 903
  902 S = ST(1,1)/ST(1,NP)
      IF (0.01.LT.S.AND.S.LT.100.0) GØ TØ 903
      NERRØR = 33
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  903 CØNTINUE
      DØ 2108 LL=1,NP
      HØ = 1.0
      T = 1.0
      GØ TØ (711,600,711,32,33,34,32,33,34,28,29,30),ISTTAB
  600 GØ TØ (701,702,703),THICK
  703 HØ = ST(4,LL)
  702 T = ST(3,LL)
  701 HI = ST(2,LL)
      GØ TØ 714
  711 CØNTINUE
      XK11 = ST(2,LL)
      XK12 = ST(3,LL)
      XK22 = ST(4,LL)
      XK33 = ST(5,LL)
      XD11 = ST(6,LL)
      XD12 = ST(7,LL)
      XD22 = ST(8,LL)
      XD33 = ST(9,LL)
      XK21 = XK12
      XD21 = XD12
      GØ TØ 814
   34 HØ = ST(9,LL)
   33 T = ST(8,LL)
   32 HI = ST(7,LL)
      SPH = ST(5,LL)
      IF (SPH.NE.0.0) GØ TØ 714
      NERRØR = 9
      IF (ISTTAB.GE.7.AND.ISTTAB.LE.9) NERRØR = 26
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
      GØ TØ 714
   30 HØ = ST(14,LL)
   29 T = ST(13,LL)
   28 HI = ST(12,LL)
```

```
      SPH = ST(10,LL)
      STH = ST(11,LL)
      IF (STH.NE.0.0) GØ TØ 850
      NERRØR = 10
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  850 IF (SPH.NE.0.0) GØ TØ 714
      NERRØR = 11
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  714 CØNTINUE
      IF (HØ.NE.0.0) GØ TØ 802
      NERRØR = 12
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  802 IF (T.NE.0.0) GØ TØ 801
      NERRØR = 13
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  801 IF (HI.NE.0.0) GØ TØ 814
      IF (ISTTAB.EQ.6.ØR.ISTTAB.EQ.9.ØR.ISTTAB.EQ.12.ØR.(ISTTAB.EQ.2.AND
     1.THICK.EQ.3)) GØ TØ 710
      NERRØR = 14
      GØ TØ 712
  710 NERRØR = 15
  712 CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  814 CØNTINUE
      IF (ITYPE.NE.3) GØ TØ 2108
      IF (ISTTAB.NE.1.AND.ISTTAB.NE.3) GØ TØ 2108
      IF (XK11.NE.0.0) GØ TØ 2101
      NERRØR = 16
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2101 IF (XK12.NE.0.0) GØ TØ 2104
      NERRØR = 17
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2104 IF (XK21.NE.0.0) GØ TØ 2105
      NERRØR = 18
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2105 IF (XK22.NE.0.0) GØ TØ 2106
      NERRØR = 19
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2106 IF (XK33.NE.0.0) GØ TØ 2109
      NERRØR = 20
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2109 IF (XD11.NE.0.0) GØ TØ 2110
      NERRØR = 21
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2110 IF (XD12.NE.0.0) GØ TØ 2102
      NERRØR = 22
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2102 IF (XD21.NE.0.0) GØ TØ 2103
      NERRØR = 23
      CALL ETRAP
```

```
      WRITE(6,998) NRC,NSC,LL
 2103 IF (XD22.NE.0.0) GØ TØ 2107
      NERRØR = 24
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2107 IF (XD33.NE.0.0) GØ TØ 2108
      NERRØR = 25
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
 2108 CØNTINUE
      IF (NPRØB.EQ.0) GØ TØ 590
      K = NRØW+1
      JJ = 1
      JJJ = 6
      MM = 1
      DØ 17 NLC=1,NLCASE
      JT = JJ
      JTT = JJJ
      L = 0
      READ(5,1014) (LST(J),J=JJ,JJJ),DUM
 1014 FØRMAT(6I1,T1,20A4)
      WRITE(6,2001) DUM
      KELV(NSG) = LST(JT)
      IF (LST(JJ)) 8031,19,20
   20 L = LST(JJ)
      IF (NLC.EQ.1) GØ TØ 1026
      IF (LST(JT).EQ.0) GØ TØ 1026
      NERRØR = 39
      CALL ETRAP
      WRITE(6,999) NRC,NSC
 1026 IF (LST(1).NE.1.AND.(KELVIN.EQ.3.ØR.KELVIN.EQ.4)) GØ TØ 1027
      GØ TØ 1028
 1027 NERRØR = 35
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      KELV(NSG) = 5
 1028 IF (LST(1).NE.4.AND.KELVIN.EQ.1) GØ TØ 1029
      GØ TØ 1025
 1029 NERRØR = 35
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      KELV(NSG) = 5
 1025 IF (L.NE.1.AND.L.NE.4) GØ TØ 8031
      GØ TØ 19
 8031 NERRØR = 27
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      WRITE(6,223)
      GØ TØ 3
   19 JJ = JJ+1
      IF (L.NE.0.AND.KELVIN.EQ.2) GØ TØ 8075
      GØ TØ 23
 8075 NERRØR = 35
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      KELV(NSG) = 5
   23 IF (LST(JJ)) 8032,22,21
   21 L = L+1
      IF (LST(JJ).NE.1) GØ TØ 8032
   22 IF (JJ.EQ.JJJ) GØ TØ 24
      JJ = JJ+1
```

```
      GØ TØ 23
 8032 NERRØR = 27
      CALL ETRAP
      WRITE(6,999) NRC,NSC
      WRITE(6,223)
      GØ TØ 3
   24 IF (L.EQ.0) GØ TØ 71
      IF (ICHK.EQ.2.AND.LST(JJ-5).NE.0) WRITE(6,223)
      LY = K
      KK = K+L-1
      DØ 72 M=K,KK
      READ(5,1005) (ST(M,J),J=1,NP)
      WRITE(6,1205) (ST(M,J),J=1,NP)
   72 CØNTINUE
      IF (NLC.GT.1.ØR.LST(1).EQ.0) GØ TØ 660
      KY = K
      K = K+LST(1)
  660 CØNTINUE
   71 K = K+L-LST(JT)
      JJ = JJJ+1
      JJJ = JJ+5
   17 MM = MM+1
      IF (KLUT.EQ.0) GØ TØ 177
      WRITE(6,223)
      GØ TØ 3
  177 IF (IANLYZ.EQ.1) GØ TØ 590
      KK = KK+1
      IF (L.EQ.0) KK = NRØW+1
      READ(5,1005) (ST(KK,J),J=1,NP)
      WRITE(6,1205) (ST(KK,J),J=1,NP)
  590 IF (NCUPLE.EQ.0) GØ TØ 7
      IF (ISTTAB.LE.3) GØ TØ 597
      READ(5,1016) (VAR(I),I=1,4),DUM
 1016 FØRMAT(4(A4,6X),T1,20A4)
      WRITE(6,2001) DUM
      I = 0
  406 I = I+1
      DØ 405 J=1,5
      IF (VAR(I).EQ.STRESS(J)) GØ TØ 407
  405 CØNTINUE
      J = 6
  407 KLUE(I) = J
      IF (I.LT.4) GØ TØ 406
      IF (KLUE(1).NE.1.AND.KLUE(1).NE.6) GØ TØ 425
      NERRØR = 41
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  425 IF (KLUE(2).NE.1.AND.KLUE(2).NE.6) GØ TØ 426
      NERRØR = 42
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  426 IF (KLUE(3).NE.2.AND.KLUE(3).NE.6) GØ TØ 427
      NERRØR = 43
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  427 IF (KLUE(4).NE.2.AND.KLUE(4).NE.6) GØ TØ 428
      NERRØR = 44
      CALL ETRAP
      WRITE(6,999) NRC,NSC
  428 CØNTINUE
      IF (IANLYZ.EQ.1.AND.L.EQ.0) KK = NRØW
```

```
      K = KK+1
      IF (ISTTAB.GE.3.AND.ISTTAB.LE.9) KK = K+1
      IF (ISTTAB.GE.10.AND.ISTTAB.LE.12) KK = K+3
      DØ 596 I=K,KK
      READ(5,1005) (ST(I,J),J=1,NP)
      WRITE(6,1205) (ST(I,J),J=1,NP)
  596 CØNTINUE
  597 CØNTINUE
      READ(5,591) IS,SAVJTC,SAVSTP,DUM
  591 FØRMAT(3I5,T1,20A4)
      WRITE(6,2001) DUM
      IJT(NSC) = SAVJTC
      JJT(NSC) = SAVSTP
C     THE UPDATED INTERPØLATED VALUES ØF THE MATERIAL PRØPERTY CØEFFIC    303140
C     IENTS ARE FØUND IN THE XMAT TABLE AND STØRED IN THE XLAYER ARRAY    303150
    7 IF (LST(1).EQ.0) GØ TØ 3
      IF (ICHK.EQ.2) GØ TØ 3
      IF (KELVIN.NE.5) GØ TØ 125
      IF (LST(1).EQ.1) KELVIN = 3
      IF (LST(1).EQ.4) KELVIN = 1
  125 CØNTINUE
      DØ 123 LL=1,NP
      L=(MAT-1)*2+1                                                       303160
      II=NXMAT(L)                                                         303170
       III=NXMAT(L+1)                                                     303180
      M=1                                                                 303190
      GØ TØ (91,123,93,93),KELVIN
   91 TEMPAV = (ST(LY,LL)+ST(LY+1,LL)+ST(LY+2,LL)+ST(LY+3,LL))/4.0
      ARG=TEMPAV                                                          303240
      GØTØ 94                                                             303250
   93 ARG = ST(NRØW + 1,LL)                                               303260
   94 DØ 104 I = 2,10                                                     303270
      IF (ARG-XMAT(II,I)) 121,123,104                                     303280
  121 IF (I-2) 8007,8007,123
 8007 NERRØR = 28
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  998 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,5X,
     1       -SEGMENT GEØMETRY TABLE ITEM -,I2,-   *-///)
      GØ TØ 123
  104 CØNTINUE
      NERRØR = 29
      CALL ETRAP
      WRITE(6,998) NRC,NSC,LL
  123 CØNTINUE
    3 IF (NCUPLE.EQ.0) GØ TØ 133
      READ(5,2000) DUM
      WRITE(6,2001) DUM
      IF (D.NE.DLIMTR) GØ TØ 3
      WRITE(6,222)
  133 CØNTINUE
      JCHK(NSC) = NCHK
      IF (NSC.LT.NSEG) GØ TØ 101
      NSC = 0
      IF (NCUPLE.EQ.0) GØ TØ 99
      IF (NRING.EQ.0) GØ TØ 210
      DØ 211 I=1,NRING
      READ(5,720) JTNØ,(XDUM(J),J=1,5),DUM
  720 FØRMAT(I2,5E14.7,T1,20A4)
      WRITE(6,2001) DUM
      READ(5,721) XDUM,DUM
```

```
721 FØRMAT(6E12.5,T1,20A4)
    WRITE(6,2001) DUM
    IF (XDUM(2)) 780,780,781
780 WRITE(6,782)
782 FØRMAT(/ 4X,-THE RING CENTRØID RADIUS IS ZERØ.-/)
    IC0UNT = IC0UNT+1
781 CØNTINUE
    READ(5,722) (XDUM(J),J=1,5),DUM
722 FØRMAT(5E14.7,T1,20A4)
211 WRITE(6,2001) DUM
680 READ(5,2000) DUM
    WRITE(6,2001) DUM
    IF (D.NE.DLIMTR) GØ TØ 680
    WRITE(6,222)
210 CØNTINUE
    NSKL = NKL
    IF (NSKL.EQ.0) GØ TØ 95
    DØ 103 NRIG=1,NSKL
    READ(5,503) JDEP,JIND,ANGLE,DUM
503 FØRMAT(2I2,E14.7,T1,20A4)
    WRITE(6,2001) DUM
    JLINK(NRIG) = JDEP
    ILINK(NRIG) = JIND
    ANGLNK(NRIG) = ANGLE
    IF (JIND.LT.JDEP) GØ TØ 103
    NERRØR = 30
    CALL ETRAP
103 CØNTINUE
  4 READ(5,2000) DUM
    WRITE(6,2001) DUM
    IF (D.NE.DLIMTR) GØ TØ 4
    WRITE(6,222)
 95 NSEG = NST
    NLINK = NKL
    DØ 3030 ISEG = 1,NSEG
    NCHK = JCHK(ISEG)
    KSEG = ISEG
    IF (MGEØM(ISEG).NE.6) GØ TØ 195
    ANG = ANGL(ISEG)
    NRZIN = NRZN(ISEG)
    IF (NRZIN.GE.15) GØ TØ 195
    DØ 192 I=1,NRZIN
    ZI(I) = ZJ(I,ISEG)
192 RI(I) = RJ(I,ISEG)
195 CØNTINUE
    CALL GRAPH (NCHK,NRC)
    IF (NCHK.EQ.1) GØ TØ 3031
3030 CØNTINUE
3031 NZR = NRC
    JCLUE = 0
    IF (NCHK.EQ.1.AND.KSEG.EQ.1) JCLUE = 1
    IF (NCHK.EQ.1.AND.KSEG.GT.1) JCLUE = 2
    CALL ZPLØT (JCLUE)
 99 CØNTINUE
    CALL BØZØ (NCUPLE)
320 CØNTINUE
888 IF (IC0UNT.EQ.0) GØ TØ 889
    WRITE(6,866) IC0UNT
866 FØRMAT(10(/),100X,I5,- ERRØRS LØCATED.-)
    GØ TØ 1
889 WRITE(6,865)
```

```
 865 FØRMAT(10(/),100X,-NØ DETECTABLE ERRØRS FØUND.-)
     GØ TØ 1
 555 CALL ENDJØB
     STØP
     END
FØR,IS BØZØ,BØZØ
     SUBRØUTINE BØZØ (NCUPLE)
     INTEGER*2 NXMAT,LST,KELV,LAYR,NPS
     CØMMØN NERRØR,IC0UNT,XMAT(110,10),NXMAT(20),ST(70,31),DUM(20),
    1       KELV(900),LAYR(900),NPS(900),NHAR,NSMAX,NMPT,NGRAPH,LST(61)
     DIMENSIØN XDUM(6)
     DIMENSIØN LDEF(11),LANG(36)
     DIMENSIØN THEANG(36),STFCØN(4),DLP(4)
     EQUIVALENCE (DUM(1),D)
     DATA DLIMTR/4H----/
     IF (NCUPLE.EQ.0) GØ TØ 7
     READ(5,601) NØJ,NØRING,NLINK,DUM
 601 FØRMAT(3I5,T1,20A4)
     WRITE(6,2001) DUM
2001 FØRMAT(1X,20A4)
     IF (NØRING.LE.28) GØ TØ 214
     NERRØR = 54
     CALL ETRAP
 214 CØNTINUE
     IF (NØRING.EQ.0) GØ TØ 210
     DØ 211 I=1,NØRING
     READ(5,750) JTNØ,(XDUM(J),J=1,5),DUM
 750 FØRMAT(I2,5E14.7,T1,20A4)
     WRITE(6,2001) DUM
     READ(5,751) XDUM,DUM
 751 FØRMAT(6E12.5,T1,20A4)
     WRITE(6,2001) DUM
     IF (XDUM(2)) 783,783,784
 783 WRITE(6,785)
 785 FØRMAT(/  4X,-THE RING CENTRØID RADIUS IS ZERØ.-/)
     IC0UNT = IC0UNT+1
 784 CØNTINUE
     READ(5,752) (XDUM(J),J=1,5),DUM
 752 FØRMAT(5E14.7,T1,20A4)
 211 WRITE(6,2001) DUM
 680 READ(5,2000) DUM
     WRITE(6,2001) DUM
     IF (D.NE.DLIMTR) GØ TØ 680
     WRITE(6,222)
 210 CØNTINUE
     IF (NLINK.EQ.0) GØ TØ 3108
     DØ 602 NRIG=1,NLINK
     READ(5,603) JD,JI,C0TAN,DUM
 603 FØRMAT(2I2,E14.7,T1,20A4)
     WRITE(6,2001) DUM
     LST(NRIG) = JD
     IF (NRIG.EQ.1) GØ TØ 605
     IF (JDD.LT.JD) GØ TØ 605
     NERRØR = 31
     CALL ETRAP
     IF (JDD.GE.JD) GØ TØ 602
 605 JDD = JD
 602 CØNTINUE
   5 READ(5,2000) DUM
2000 FØRMAT(20A4)
     WRITE(6,2001) DUM
```

```
      IF (D.NE.DLIMTR) GØ TØ 5
      WRITE(6,222)
  222 FØRMAT(/)
 3108 CØNTINUE
      DØ 109 J=1,NØJ
      READ(5,110) JN,DLP,ANGL,DUM
  110 FØRMAT(I2,4F2.0,E14.1,T1,20A4)
      WRITE(6,2001) DUM
      IF (NLINK.EQ.0) GØ TØ 109
      DØ 130 N=1,NLINK
      IF (JN.EQ.LST(N)) GØ TØ 132
  130 CØNTINUE
      GØ TØ 109
  132 DØ 131 I=1,4
      IF (DLP(I).EQ.0.0) GØ TØ 131
      NERRØR = 34
      CALL ETRAP
      GØ TØ 109
  131 CØNTINUE
  109 CØNTINUE
    6 READ(5,2000) DUM
      WRITE(6,2001) DUM
      IF (D.NE.DLIMTR) GØ TØ 6
      WRITE(6,222)
      READ(5,556) NES,DUM
  556 FØRMAT(I4,T1,20A4)
      WRITE(6,2001) DUM
      IF (NES.EQ.0) GØ TØ 152
      DØ 150 I=1,NES
      READ(5,143) NØJNT,(STFCØN(J),J=1,4),DUM
  143 FØRMAT(I5,4E14.7,T1,20A4)
      WRITE(6,2001) DUM
  150 CØNTINUE
  152 READ(5,2000) DUM
      WRITE(6,2001) DUM
      IF (D.NE.DLIMTR) GØ TØ 152
      WRITE(6,222)
      READ(5,302) LINLØD,DUM
  302 FØRMAT(I4,T1,20A4)
      WRITE(6,2001) DUM
      IF (LINLØD.EQ.0) GØ TØ 7
      DØ 304 N=1,LINLØD
      READ(5,305) JEXT2,JEXT1,XFL,DUM
  305 FØRMAT(2I5,E14.7,T1,20A4)
      WRITE(6,2001) DUM
  304 CØNTINUE
    7 READ(5,2000) DUM
      WRITE(6,2001) DUM
      IF (D.NE.DLIMTR) GØ TØ 7
      WRITE(6,222)
      IF (NHAR.EQ.1) GØ TØ 679
      DØ 650 II=2,NHAR
      DØ 645 LL=1,NSMAX
      L = 0
      JJ = 1
      JJJ = 6
      MM = 1
      READ(5,618) (LST(J),J=1,6),NNP,DUM
  618 FØRMAT(6I1,64X,I2,T1,20A4)
      WRITE(6,2001) DUM
      NPSS = NPS(LL)
```

```
      IF (NPSS.EQ.31) GØ TØ 705
      IF (NPSS.GE.2.AND.NPSS.LE.30) GØ TØ 704
      NERRØR = 3
      CALL ETRAP
      WRITE(6,997) II,LL
      WRITE(6,223)
  223 FØRMAT(28X,103H*   DUE TØ INPUT ERRØR IT IS IMPØSSIBLE TØ CHECK TH
     1E FØLLØWING CARDS UP TØ THE DASH-SEPARATØR CARD.   */)
      GØ TØ 9
  704 IF (NPSS.NE.NNP) GØ TØ 706
      IF (KELV(LL).EQ.5) GØ TØ 700
      IJ = LST(1)
      IF (IJ.EQ.0.ØR.IJ.EQ.1.ØR.IJ.EQ.4) GØ TØ 782
      NERRØR = 27
      CALL ETRAP
      WRITE(6,997) II,LL
      WRITE(6,223)
      GØ TØ 9
  782 IF (KELV(LL).NE.IJ) GØ TØ 781
      IF (LST(1)) 8058,615,610
  610 L = LST(1)
  615 JJ = JJ+1
  631 IF (LST(JJ)) 8058,625,620
  620 L = L+1
      IF (LST(JJ).EQ.1) GØ TØ 625
      NERRØR = 27
      CALL ETRAP
      WRITE(6,997) II,LL
      WRITE(6,223)
      GØ TØ 9
  625 IF (JJ.EQ.JJJ) GØ TØ 630
      JJ = JJ+1
      GØ TØ 631
  630 IF (L.EQ.0) GØ TØ 645
      IF (IJ.EQ.0) GØ TØ 725
      IF (LAYR(LL).LE.NMPT) GØ TØ 739
      NERRØR = 52
      CALL ETRAP
      WRITE(6,997) II,LL
  739 CØNTINUE
      DØ 720 M=1,IJ
      READ(5,635) (ST(M,J),J=1,NNP)
      WRITE(6,1205) (ST(M,J),J=1,NNP)
 1205 FØRMAT(1X,5E14.7)
  720 CØNTINUE
      IF (LAYR(LL).EQ.NMPT+1) GØ TØ 725
      DØ 721 N=1,NNP
      L2 = (LAYR(LL)-1)*2+1
      I2 = NXMAT(L2)
      I3 = NXMAT(L2+1)
      DØ 737 J=1,IJ
      DØ 730 I=2,10
      IF (ST(J,N)-XMAT(I2,I)) 731,721,730
  731 IF (I-2) 735,735,721
  735 NERRØR = 28
      CALL ETRAP
      WRITE(6,996) II,LL,N
  996 FØRMAT(/5X,'*   HARMØNIC NUMBER -',I2,5X,'-SEGMENT NUMBER -',I3,5X,
     1     '-SEGMENT GEØMETRY TABLE ITEM -',I2,'-   *-///)
      GØ TØ 721
  730 NERRØR = 29
```

```
      CALL ETRAP
      WRITE(6,996) II,LL,N
  737 CØNTINUE
  721 CØNTINUE
  725 MM = IJ+1
      DØ 640 M=MM,L
      READ(5,635) (ST(1,J),J=1,NNP)
  635 FØRMAT(5E14.7)
      WRITE(6,1205) (ST(1,J),J=1,NNP)
  640 CØNTINUE
  645 CØNTINUE
      IF (NCUPLE.EQ.0) GØ TØ 650
      GØ TØ 3000
 8058 NERRØR = 27
      CALL ETRAP
      WRITE(6,997) II,LL
      WRITE(6,223)
      GØ TØ 9
  700 NERRØR = 49
      CALL ETRAP
      WRITE(6,997) II,LL
  997 FØRMAT(/5X,-*   HARMØNIC NUMBER -,I2,5X,-SEGMENT NUMBER -,I3,
     1       -   *-///)
      WRITE(6,223)
      GØ TØ 9
  781 NERRØR = 50
      CALL ETRAP
      WRITE(6,997) II,LL
      WRITE(6,223)
      GØ TØ 9
  705 NERRØR = 49
      CALL ETRAP
      WRITE(6,997) II,LL
      WRITE(6,223)
      GØ TØ 9
  706 NERRØR = 51
      CALL ETRAP
      WRITE(6,997) II,LL
      WRITE(6,223)
      GØ TØ 9
 3000 READ(5,556) NES,DUM
      WRITE(6,2001) DUM
      IF (NES.EQ.0) GØ TØ 652
      DØ 656 IK=1,NES
      READ(5,143) NØJNT,(STFCØN(J),J=1,4)
      WRITE(6,2001)
  656 CØNTINUE
  652 READ(5,302) LNLØD,DUM
      WRITE(6,2001) DUM
      IF (LNLØD.EQ.0) GØ TØ 650
      DØ 653 LIL=1,LNLØD
      READ(5,305) JX2,JX1,XXF,DUM
      WRITE(6,2001) DUM
  653 CØNTINUE
  650 CØNTINUE
    9 READ(5,2000) DUM
      WRITE(6,2001) DUM
      IF (D.NE.DLIMTR) GØ TØ 9
      WRITE(6,222)
      IF (NCUPLE.EQ.0) GØ TØ 673
      READ(5,675) NANG,DUM
```

```
  675 FØRMAT(I2,T1,20A4)
      WRITE(6,2001) DUM
      IF (NANG.GE.1.AND.NANG.LE.36) GØ TØ 2201
      NERRØR = 48
      CALL ETRAP
      WRITE(6,223)
      GØ TØ 10
 2201 CØNTINUE
      READ(5,678) (THEANG(I),I=1,NANG)
  678 FØRMAT(5E14.0)
      WRITE(6,1205) (THEANG(I),I=1,NANG)
  679 IF (NGRAPH.EQ.0) GØ TØ 10
      READ(5,1506) LDEF,LANG,DUM
 1506 FØRMAT(11I1,9X,36I1,T1,20A4)
      WRITE(6,2001) DUM
   10 READ(5,2000) DUM
      WRITE(6,2001) DUM
      IF (D.NE.DLIMTR) GØ TØ 10
      WRITE(6,222)
  673 CØNTINUE
      RETURN
      END
FØR,IS GRAPH,GRAPH
      SUBRØUTINE GRAPH (NCHK,NRC)
      CØMMØN/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,
     2JJT(30),IJT(30)
      CØMMØN/GPLØT/ZZ(600),RRAD(600),NPT,NZR
      CØMMØN /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,
     1                PØLY(10),NCØEF
      CØMMØN NERRØR
      DIMENSIØN PHI(20),RAD(20),Z(20)
      DIMENSIØN IDARY(2)
      DIMENSIØN R(3),ZE(9)
      DATA IDARY/-HARDCØ-,-PY    -/
      DATA AAA/-A   -/
      DØ 600 I=1,20
      RAD(I) = 0.0
  600 Z(I) = 0.0
      IF(ISEG .NE.1)GØ TØ 20
      NPT=0
      RELØR = 0.0
      IF(IREGC .NE.1)GØ TØ 20
      CALL IDENT (9,IDARY)
      IREGC = 2
   20 IF (NCHK.EQ.1) GØ TØ 999
      MG = MGEØM(ISEG)
      GØ TØ (30,30,80,70,30,30,160,999),MG
   30 CØNTINUE
      DELTA=(STP(ISEG)-STIC(ISEG))/19.0
      DØ 50 I = 1,19
      PHI(I)= (I-1)*DELTA + STIC(ISEG)
   50 CØNTINUE
      PHI(20)= STP(ISEG)
   60 GØ TØ(100,90,80,70,130,120,160),MG
C
C     CYLINDER
C
   70 CØNTINUE
      NUMPT= 2
      RAD(1) = G1(ISEG)
```

```
      RAD(2) = RAD(1)
      Z(1) = STP(ISEG)-STIC(ISEG)
      Z(2)= 0.0
      GØ TØ 200
C
C     CØNE
C
   80 CØNTINUE
      PHIANG= G1(ISEG)
      CØSP= CØS(PHIANG)
      RAD(1)= STIC(ISEG)* CØSP
      RAD(2)= STP(ISEG)*  CØSP
      Z(1)= SIN(PHIANG)*(STP(ISEG)-STIC(ISEG))
      Z(2)= 0.0
      NUMPT = 2
      GØ TØ 200
C
C     ØGIVE
C
   90 CØNTINUE
      CØSP= CØS(STP(ISEG))
      DØ 95 I=1,20
      RAD(I)= (G1(ISEG)*SIN(PHI(I))) - G2(ISEG)
      Z(I)= G1(ISEG)*(CØS(PHI(I))-CØSP)
   95 CØNTINUE
      Z(20)= 0.0
      NUMPT =20
      GØ TØ 200
C
C     ELIPSE-(G3 IS ØFFSET DISTANCE)
C
  100 CØNTINUE
      BB= G2(ISEG)
      C= G3(ISEG)
      A= G1(ISEG)
      B= G2(ISEG)* A
      DØ 109 I=1,20
      CØSP= CØS(PHI(I))
      SINP= SIN(PHI(I))
      RAD(I) = SINP*A/((SINP**2+BB**2*CØSP**2)**.5)-C
      Z(I) = B*SQRT(1.0-(RAD(I)+C)**2/A**2)
      IF (PHI(I).GT.1.5708.AND.PHI(I).LT.4.61239) Z(I) = -Z(I)
  109 CØNTINUE
      DØ 107 I=1,20
  107 Z(I) = Z(I)-Z(20)
      NUMPT = 20
      GØ TØ 200
C
C     GENERAL GEØMETRY
C
  120 CØNTINUE
      CALL GEØMET
      DØ 450 K=1,20
      ARG = PHI(K)
      DØ 404 J=1,100
      PHØ = PSI(J)
      IF (ANG.EQ.AAA) IF (ARG-PHØ) 421,423,404
      IF (PHØ-ARG) 421,423,404
  421 IF (J-1) 8502,8502,424
  404 CØNTINUE
      GØ TØ 8503
```

```
  423 RAD(K) = RADR(J)
      GØ TØ 450
 8502 NERRØR = 56
      CALL ETRAP
      WRITE(6,989) NRC,ISEG
  989 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,-   *-
     1       ///)
      NCHK = 1
      GØ TØ 999
 8503 NERRØR = 57
      CALL ETRAP
      WRITE(6,989) NRC,ISEG
      NCHK = 1
      GØ TØ 999
  424 SUB1 = ARG-PSI(J-1)
      SUB2 = PSI(J)-PSI(J-1)
      RAD(K) = RADR(J-1)+(RADR(J)-RADR(J-1))*SUB1/SUB2
  450 CØNTINUE
      RMAX = RI(1)
      RMIN = RI(1)
      DØ 365 K=2,NRZIN
      IF (RI(K).LT.RMIN) RMIN = RI(K)
      IF (RI(K).GT.RMAX) RMAX = RI(K)
  365 CØNTINUE
      DØ 401 J=1,20
      IF (RAD(J).LT.RMIN) RAD(J) = RMIN
      IF (RAD(J).GT.RMAX) RAD(J) = RMAX
  401 CØNTINUE
      P1 = 3.1415926/2.0
      P3 = 3.0*P1
      DØ 449 J=1,20
      PHØ = PHI(J)
      IF (PHØ.LT.P1.ØR.PHØ.GT.P3) GØ TØ 353
      AA = RI(1)
      III = 1
      C = AA
      I = III
      JJ = 1
      DØ 451 K=2,NRZIN
      IF (ANG.EQ.AAA) IF (RAD(J)-RI(K)) 350,360,452
      IF (RI(K)-RAD(J)) 350,360,452
  350 C = RI(K)
      I = K
      JJ = I
  451 CØNTINUE
  452 D = RI(K)
      II = K
      JJJ = II
      IF (I.NE.1) GØ TØ 460
      AA = RI(K+1)
      III = K+1
      R(1) = C
      R(2) = D
      R(3) = AA
      ZE(4) = ZI(I)
      ZE(5) = ZI(II)
      ZE(6) = ZI(III)
      GØ TØ 480
  460 CØNTINUE
      AA = RI(K-2)
      III = K-2
```

```
      R(1) = AA
      R(2) = C
      R(3) = D
      ZE(4) = ZI(III)
      ZE(5) = ZI(I)
      ZE(6) = ZI(II)
      GØ TØ 480
  353 AA = RI(NRZIN)
      III = NRZIN
      C = A
      I = III
      JJ = NRZIN
      L = NRZIN-1
      K = L
      DØ 453 M=1,L
      IF (ANG.EQ.AAA) IF (RAD(J)-RI(K)) 349,360,454
      IF (RI(K)-RAD(J)) 349,360,454
  349 C = RI(K)
      I = K
      JJ = I
      K = K-1
  453 CØNTINUE
  454 D = RI(K)
      II = K
      JJJ = II
      IF (I.NE.NRZIN) GØ TØ 470
      AA = RI(K-1)
      III = K-1
      R(1) = C
      R(2) = D
      R(3) = AA
      ZE(4) = ZI(I)
      ZE(5) = ZI(II)
      ZE(6) = ZI(III)
      GØ TØ 480
  470 CØNTINUE
      AA = RI(K+2)
      III = K+2
      R(1) = AA
      R(2) = C
      R(3) = D
      ZE(4) = ZI(III)
      ZE(5) = ZI(I)
      ZE(6) = ZI(II)
  480 CØNTINUE
      ZE(1) = ZE(4)*ZE(4)
      ZE(2) = ZE(5)*ZE(5)
      ZE(3) = ZE(6)*ZE(6)
      ZE(7) = 1.0
      ZE(8) = 1.0
      ZE(9) = 1.0
      IF (PHØ.GE.P1.AND.PHØ.LE.P3) GØ TØ 370
      ITMP = JJ
      JJ = JJJ
      JJJ = ITMP
  370 CØNTINUE
      CALL SIMQ (ZE,R)
      AA = R(1)
      BB = R(2)
      CC = R(3)
      DISC = BB*BB-4.0*AA*(CC-RAD(J))
```

```
      IF (DISC.LT.0.0) GØ TØ 8777
      Z1 = (-BB+SQRT(DISC))/(2.0*AA)
      Z2 = (-BB-SQRT(DISC))/(2.0*AA)
      IF (Z1.GE.ZI(JJ).AND.Z1.LE.ZI(JJJ)) Z(J) = Z1
      IF (Z2.GE.ZI(JJ).AND.Z2.LE.ZI(JJJ)) Z(J) = Z2
      GØ TØ 449
 8777 WRITE(6,8778) J
 8778 FØRMAT(//- FØR J =-,I3,- THE RØØTS ARE IMAGINARY-)
      GØ TØ 449
  360 Z(J) = ZI(K)
  449 CØNTINUE
      NUMPT = 20
      GØ TØ 200
C
C     MØDIFIED ELIPSE
C
  130 CØNTINUE
      A = G2(ISEG)
      DØ 110 I=1,20
      CØSP = CØS(PHI(I))
      SINP = SIN(PHI(I))
      SINP1 = 1.0/(SINP+1.0)
      RAD(I) = 2.0*A*SINP*SINP1
  110 Z(I) = 2.0*A*CØSP*(2.0-SINP1)/(3.0*(SINP+1.0))
      DØ 111 I=1,20
  111 Z(I) = Z(I)-Z(20)
      NUMPT = 20
      GØ TØ 200
C
C     DUMMY GEØMETRY
C
  160 CØNTINUE
  200 CØNTINUE
      IF(ISEG .NE.1)GØ TØ 220
      IF(JJT(1) .GT. IJT(1))GØ TØ 230
      GØ TØ 250
  220 CALL KLINK(IRET,LNKNUM)
      GØ TØ (230,250,230,250),IRET
C
C     CØNNECTED AT ITH-JØINT
C
  230 CØNTINUE
      Z1 = Z(1)
      DØ 240 I=1,NUMPT
      Z(I) = Z(I) - Z1
  240 CØNTINUE
      GØ TØ 270
C
C     CØNNECTED AT J-JØINT
C
  250 INDX= NUMPT/2
      DØ 260 I=1,INDX
      K= NUMPT+1-I
      TEMPZ= Z(I)
      TEMPR= RAD(I)
      Z(I)= Z(K)
      RAD(I)=RAD(K)
      Z(K)= TEMPZ
      RAD(K)= TEMPR
  260 CØNTINUE
C
```

```
C      ADD LAST RELATIVE ØRIGIN
C
  270 DØ 280 I=1,NUMPT
      Z(I) = Z(I)+RELØR
  280 CØNTINUE
      RELØR = Z(NUMPT)
      IF(ISEG .EQ.1)GØ TØ 300
      GØ TØ (300,300,290,290),IRET
C
C     KINEMATIC LINK AT THIS JØINT-ADJUST Z-CØØRDINATE
C
  290 DZ=(RAD(1)-RADØLD)* CØTAN(ANGLNK(LNKNUM))
      DØ 295 I=1,NUMPT
      Z(I)= Z(I) + DZ
  295 CØNTINUE
      D = CØTAN(ANGLNK(LNKNUM))
  300 RADØLD=RAD(NUMPT)
      RELØR = Z(NUMPT)
      DØ 310 I=1,NUMPT
      RRAD( I+NPT)= RAD(I)
      ZZ(  I+NPT) = Z(I)
  310 CØNTINUE
      NPT=NPT+NUMPT
  999 RETURN
      END
 FØR,IS KLINK,KLINK
      SUBRØUTINE KLINK(IRET,LNKNUM)
      CØMMØN/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,
     2JJT(30),IJT(30)
      ISEGC = ISEG
      IF(IJT(ISEGC).EQ. IJT(ISEGC-1).ØR.IJT(ISEGC).EQ.JJT(ISEGC-1))
     1GØ TØ 10
      IF(JJT(ISEGC).NE. IJT(ISEGC-1).AND. JJT(ISEGC).NE.JJT(ISEGC-1))
     1GØ TØ 30
C     CØNNECTED AT J-JØINT
      IRET= 2
      GØ TØ 100
C     CØNNECTED AT I-TH JØINT
   10 IRET= 1
      GØ TØ 100
C
C     IS THERE A KINEMATIC LINK
C
   30 DØ 50 I=1,NLINK
      IF(IJT(ISEGC).EQ. JLINK(I))GØ TØ 40
      IF(JJT(ISEGC).NE. JLINK(I))GØ TØ 50
      IRET= 4
      GØ TØ 45
   40 IRET=3
   45 LNKNUM= I
      GØ TØ 100
   50 CØNTINUE
      WRITE(6,60)
   60 FØRMAT(/,1X,-***-ERRØR-UNCØNNECTED JØINT BETWEEN SEGMENTS- )
      STØP
  100 RETURN
      END
 FØR,IS ZPLØT,ZPLØT
      SUBRØUTINE ZPLØT (JCLUE)
      CØMMØN/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),
```

```
     1IREGC,ISEG ,NSEG,MGE0M(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,
     2JJT(30),IJT(30)
      C0MM0N /GPL0T/ ZZ(600),RRAD(600),NPT,NZR,DX
      DIMENSI0N YTITLE(12),XTITLE(12)
      DIMENSI0N TITLE(12)
      DIMENSI0N ALPHA(3)
      EXTERNAL TABL1V
      DATA YTITLE/-Z - AX-,-IS    -,10*6H      /
      DATA XTITLE/-RADIUS-,- 0F RE-,-V0LUTI-,-0N    -,8*6H      /
      DATA TITLE/-     R-,-EGI0N -,-NUMBER-,-      -,-      -,-      -,
     1          -    -,- SEGME-,-NTS   -,-      -,-      -,- LINKS-/
      CALL CHSIZV (2,2)
      CALL RITSTV (13,19,TABL1V)
C
      DS = DX
      IF (JCLUE.EQ.1) G0 T0 200
      YMIN = ZZ(1)
      YMAX = ZZ(1)
      XMIN = 0.0
      XMAX = RRAD(1)
      D0 400 J=2,NPT
      IF (ZZ(J).LE.YMIN) YMIN = ZZ(J)
      IF (ZZ(J).GT.YMAX) YMAX = ZZ(J)
      IF (RRAD(J).GT.XMAX) XMAX = RRAD(J)
  400 C0NTINUE
      IF (DX.NE.0.0) G0 T0 500
      DX = XMAX-XMIN
      DV = YMAX-YMIN
      IF (DV.LT.DX) DV = DX
      G0 T0 600
  500 DV = DX
  600 C0NTINUE
      YDIF = (YMAX-YMIN)/2.0+YMIN
      YMIN = YDIF-DV/2.0
      YMAX = YDIF+DV/2.0
      XDIF = (XMAX-XMIN)/2.0+XMIN
      XMIN = XDIF-DV/2.0
      XMAX = XDIF+DV/2.0
      CALL SCRND (XMAX,XMIN,XMX,XMN)
      CALL SCRND (YMAX,YMIN,YMX,YMN)
      CALL QUIK3L (-1,XMN,XMX,YMN,YMX,1H*,XTITLE,YTITLE,-NPT,RRAD,ZZ)
  200 IF (JCLUE.EQ.1) CALL FRAMEV (2)
      ENC0DE (801,ALPHA) NZR,NSEG,NLINK
  801 F0RMAT(3I6)
      TITLE(4) = ALPHA(1)
      TITLE(7) = ALPHA(2)
      TITLE(11) = ALPHA(3)
      CALL RITE2V (46,1005,1023,90,1,72,1,TITLE,IERR)
      IF (JCLUE.EQ.0) G0 T0 99
      CALL CHSIZV (9,9)
      CALL RITSTV (48,68,TABL1V)
      I = 100
      J = 900
      CALL RITE2V (I,J,1023,90,1,6,1,6HDUE T0,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,5,1,5HINPUT,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,5,1,5HERR0R,IERR)
      IF (JCLUE.EQ.1) G0 T0 100
      J = J-100
      CALL RITE2V (I,J,1023,90,1,11,1,11HTHE REST 0F,IERR)
```

```
  100 J = J-100
      CALL RITE2V (I,J,1023,90,1,11,1,11HTHIS REGIØN,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,6,1,6HIS NØT,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,9,1,9HGRAPHABLE,IERR)
   99 CØNTINUE
      DX = DS
      RETURN
      END
 FØR,IS GEØMET,GEØMET
      SUBRØUTINE GEØMET                                                  2700010
C     THIS SUBRØUTINE CALCULATES THE GEØMETRY FØR A SHELL SEGMENT.       2700020
C     THE INPUT VARIABLES ARE . . .                                      2700030
C             RI(I) - - DISTANCE FRØM AXIS ØF REV. TØ PØINTS             2700040
C                       ØN SHELL MERIDIAN.                               2700050
C             ZI(I) - - DISTANCE ALØNG AXIS ØF REV. TØ THE               2700060
C                       INTERSECTIØN ØF THE CØRRESPØNDING RI(I) AND      2700070
C                       THE AXIS ØF REV.                                 2700080
C             NRZIN - - NUMBER ØF (RI,ZI) PAIRS READ AS INPUT.           2700090
C                                                                        2700100
      CØMMØN /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,
     1                P0LY(10),NCØEF
      DIMENSIØN CI(4,13),DRDZ(14),SØUT(14),S(101),RADD(100)              2700130
C                                                                        2700140
      FUN(ARG) = SQRT(1.0 + ARG**2)                                      2700150
C                                                                        2700160
      RADS = 3.1415926/180.0                                             2700170
      DATA B/-B   -/                                                     2700180
      AMULT = 1.0                                                        2700190
      IF (ANG.EQ.B) AMULT = -1.0                                         2700200
C                                                                        2700210
C     PASS SPLINE CURVE THRØUGH INPUT PØINTS ØN SHELL MERIDIAN, AND      2700220
C     CØMPUTE DR/DZ AT THESE PØINTS.                                     2700230
C                                                                        2700240
      CALL PLICØ (ZI,RI,NRZIN,CI)                                        2700250
      NDELZ = NRZIN - 1                                                  2700260
      DØ 60 I=1,NRZIN                                                    2700270
      CALL PLINE (ZI,RI,NRZIN,CI,ZI(I),FAKE1,DRDZ(I),FAKE2)              2700280
   60 CØNTINUE                                                           2700290
C                                                                        2700300
C     CØMPUTE MERIDIØNAL ARC LENGTH TØ INTERPØLATED PØINTS BY            2700310
C     NUMERICAL INTEGRATIØN (SIMPSØNS RULE).  SINCE SIMPSØNS RULE        2700320
C     REQUIRES AN EVEN NUMBER ØF PARTITIØNS, INTERPØLATE A PØINT         2700330
C     MIDWAY BETWEEN EACH PAIR ØF PØINTS USING SUBRØUTINE SPLINE.        2700340
C                                                                        2700350
      SØUT(1) = 0.                                                       2700360
      DØ 70 I=1,NDELZ                                                    2700370
      DZ2=(ZI(I+1)-ZI(I))/2.0                                            2700380
      DZ6=DZ2/3.0                                                        2700390
      CALL PLINE (ZI,RI,NRZIN,CI,ZI(I)+DZ2,FAKE1,DRDZM,FAKE2)            2700400
      SØUT(I+1) = SØUT(I) + DZ6*(FUN(DRDZ(I)) + 4.0*FUN(DRDZM) +         2700410
     1            FUN(DRDZ(I+1)))                                        2700420
   70 CØNTINUE                                                           2700430
C                                                                        2700440
C     USE SPLICØ TØ REPRESENT RI(I) AS A FUNCTIØN ØF SØUT(I).  THEN USE  2700450
C     SPLINE TØ INTERPØLATE RADD.                                        2700460
C                                                                        2700500
      ØLDH1 = SØUT(NRZIN)/99.0                                           2700510
  100 CALL PLICØ (SØUT,RI,NRZIN,CI)                                      2700520
      DØ 110 I=1,100                                                     2700530
```

```
      S(I) = FLØAT(I-1)*ØLDH1                                          2700540
      CALL PLINE (SØUT,RI,NRZIN,CI,S(I),RADR(I),RADD(I),RADD2)
      IF (ABS(RADD(I)).GT.1.0) RADD(I)=1.0                             2700560
  110 CØNTINUE                                                         2700600
      DØ 180 J=1,100                                                   2700610
      CØSPSI = AMULT*RADD(J)                                           2700620
      PSI(J) = ARCØS(CØSPSI)                                           2700630
      IF (ANG.EQ.8) GØ TØ 180
      PSI(J) = 2.0*3.1415926-PSI(J)                                    2700660
  180 CØNTINUE                                                         2700780
      RETURN                                                           2700830
      END
 FØR,IS PLINE,PLINE
      SUBRØUTINE PLINE (X,Y,M,C,XINT,YINT,DYDX,D2YDX2)
C     SUBRØUTINE FØR SPLINE FIT INTERPØLATIØN IN THE TABLE ØF VALUES   2800020
C     (X1,Y1) TØ (XM,YM), WHERE M MAY BE AS LARGE AS 100, WHERE THE    2800030
C     CØNSTANTS C(1,K),C(2,K),C(3,K) AND C(4,K) ARE ALREADY CØMPUTED   2800040
C     AND STØRED.                                                      2800050
C     SUBRØUTINE ALSØ CØMPUTES DY/DX AND D2Y/DX2 AT XINT.              2800060
      DIMENSIØN X(14),Y(14),C(4,13)                                    2800070
      IF (XINT-X(1)) 80,10,20                                          2800080
   10 YINT = Y(1)                                                      2800090
      K=1                                                              2800100
      GØ TØ 70                                                         2800110
   20 K = 1                                                            2800120
   30 IF (XINT-X(K+1)) 60,40,50                                        2800130
   40 YINT = Y(K+1)                                                    2800140
      GØ TØ 70                                                         2800150
   50 K = K + 1                                                        2800160
      IF (M-K) 80,80,30                                                2800170
   60 YINT = (X(K+1) - XINT)*(C(1,K)*(X(K+1)-XINT)**2+C(3,K))          2800180
      YINT = YINT + (XINT-X(K))*(C(2,K)*(XINT-X(K))**2+C(4,K))         2800190
   70 DYDX=-3.0*(C(1,K)*(X(K+1)-XINT)**2-C(2,K)*(XINT-X(K))**2)        2800200
     1      -C(3,K)+C(4,K)                                             2800210
      D2YDX2=6.0*(C(1,K)*(X(K+1)-XINT)+C(2,K)*(XINT-X(K)))             2800220
      RETURN                                                           2800230
   80 WRITE (6,90)                                                     2800240
   90 FØRMAT (31H ØUT ØF RANGE FØR INTERPØLATIØN)                      2800250
      RETURN                                                           2800260
      END                                                              2800270
 FØR,IS PLICØ,PLICØ
      SUBRØUTINE PLICØ (X,Y,M,C)
C     SUBRØUTINE TØ DETERMINE C(1,K),C(2,K),C(3,K) AND C(4,K).         2900020
      DIMENSIØN X(14),Y(14),A(14,3),B(14),Z(14)                        2900030
      DIMENSIØN D(13),P(13),E(13),C(4,13)                              2900040
      MM = M-1                                                         2900050
      DØ 10 K=1,MM                                                     2900060
      D(K) = X(K+1) - X(K)                                             2900070
      P(K) = D(K)/6.0                                                  2900080
   10 E(K) = (Y(K+1)-Y(K))/D(K)                                        2900090
      DØ 20 K=2,MM                                                     2900100
   20 B(K) = E(K) - E(K-1)                                             2900110
      A(1,2) = -1.0-D(1)/D(2)                                          2900120
      A(1,3) = D(1)/D(2)                                               2900130
      A(2,3) = P(2)-P(1)*A(1,3)                                        2900140
      A(2,2) = 2.0*(P(1)+P(2)) - P(1)*A(1,2)                           2900150
      A(2,3) = A(2,3)/A(2,2)                                           2900160
      B(2) = B(2)/A(2,2)                                               2900170
      DØ 30 K=3,MM                                                     2900180
      A(K,2) = 2.0*(P(K-1)+P(K))-P(K-1)*A(K-1,3)                       2900190
      B(K) = B(K)-P(K-1)*B(K-1)                                        2900200
```

```
      A(K,3) = P(K)/A(K,2)                                              2900210
   30 B(K) = B(K)/A(K,2)                                                2900220
      Q = D(M-2)/D(M-1)                                                 2900230
      A(M,1) = 1.0+Q+A(M-2,3)                                           2900240
      A(M,2) = -Q-A(M,1)*A(M-1,3)                                       2900250
      B(M) = B(M-2)-A(M,1)*B(M-1)                                       2900260
      Z(M) = B(M)/A(M,2)                                                2900270
      MN = M-2                                                          2900280
      DØ 40 I=1,MN                                                      2900290
      K = M-I                                                           2900300
   40 Z(K) = B(K)-A(K,3)*Z(K+1)                                         2900310
      Z(1) = -A(1,2)*Z(2)-A(1,3)*Z(3)                                   2900320
      DØ 50 K=1,MM                                                      2900330
      Q = 1.0/(6.0*D(K))                                                2900340
      C(1,K) = Z(K)*Q                                                   2900350
      C(2,K) = Z(K+1)*Q                                                 2900360
      C(3,K) = Y(K)/D(K)-Z(K)*P(K)                                      2900370
   50 C(4,K) = Y(K+1)/D(K)-Z(K+1)*P(K)                                  2900380
      RETURN                                                            2900390
      END                                                               2900400
FØR,IS SIMQ,SIMQ
      SUBRØUTINE SIMQ (A,B)
      DIMENSIØN A(1),B(1)
C
C     FØRWARD SØLUTIØN
C
      N = 3
      TØL = 0.0
      KS = 0
      JJ = -N
      DØ 65 J=1,N
      JY = J+1
      JJ = JJ+N+1
      BIGA = 0.0
      IT = JJ-J
      DØ 30 I=J,N
C
C     SEARCH FØR MAXIMUM CØEFFICIENT IN CØLUMN
C
      IJ = IT+I
      IF (ABS(BIGA)-ABS(A(IJ))) 20,30,30
   20 BIGA = A(IJ)
      IMAX = I
   30 CØNTINUE
C
C     TEST FØR PIVØT LESS THAN TØLERANCE (SINGULAR MATRIX)
C
      IF (ABS(BIGA)-TØL) 35,35,40
   35 KS = 1
      RETURN
C
C     INTERCHANGE RØWS IF NECESSARY
C
   40 I1 = J+N*(J-2)
      IT = IMAX-J
      DØ 50 K=J,N
      I1 = I1+N
      I2 = I1+IT
      SAVE = A(I1)
      A(I1) = A(I2)
      A(I2) = SAVE
```

```
C
C     DIVIDE EQUATION BY LEADING COEFFICIENT
C
   50 A(II) = A(II)/BIGA
      SAVE = B(IMAX)
      B(IMAX) = B(J)
      B(J) = SAVE/BIGA
C
C     ELIMINATE NEXT VARIABLE
C
      IF (J-N) 55,70,55
   55 IQS = N*(J-1)
      DO 65 IX=JY,N
      IXJ = IQS+IX
      IT = J-IX
      DO 60 JX=JY,N
      IXJX = N*(JX-1)+IX
      JJX = IXJX+IT
   60 A(IXJX) = A(IXJX)-(A(IXJ)*A(JJX))
   65 B(IX) = B(IX)-(B(J)*A(IXJ))
C
C     BACK SOLUTION
C
   70 NY = N-1
      IT = N*N
      DO 80 J=1,NY
      IA = IT-J
      IB = N-J
      IC = N
      DO 80 K=1,J
      B(IB) = B(IB)-A(IA)*B(IC)
      IA = IA-N
   80 IC = IC-1
      RETURN
      END
FOR,IS ETRAP,ETRAP
      SUBROUTINE ETRAP                                              2300030
      COMMON NERROR,ICOUNT
      ICOUNT = ICOUNT+1
      GO TO (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,
     1       23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,
     2       42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57),NERROR
    1 WRITE(6,101)
  101 FORMAT(/ 4X,-ONE OF THE MATERIAL PROPERTY TABLES CANNOT BE IDENTI
     1FIED AS ISOT, ORTH, OR STIF.-/)
      GO TO 99
    2 WRITE(6,102)
  102 FORMAT(/ 4X,-THE TYPE OF GEOMETRY OF A SEGMENT CANNOT BE IDENTIFI
     1ED AS ONE HANDLED BY THE PROGRAM.-/)
      GO TO 99
    3 WRITE(6,103)
  103 FORMAT(/ 4X,-THE NUMBER OF POINTS IN THE ST TABLE MUST BE BETWEEN
     1 2 AND 30.-/)
      GO TO 99
    4 WRITE(6,104)
  104 FORMAT(/ 4X,-A MATERIAL PROPERTY TABLE NAME FOR A SEGMENT CANNOT
     1BE FOUND IN THE TABLE LIST.-/)
      GO TO 99
    5 WRITE(6,105)
  105 FORMAT(/ 4X,-THE TYPE OF MATERIAL PROPERTY TABLE FOR A SEGMENT CA
     1NNOT BE IDENTIFIED AS ISOT, ORTH, OR STIF.-/)
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      GØ TØ 99
    6 WRITE(6,106)
  106 FØRMAT(/  4X,-THE PRØBLEM INPUT CAN ØNLY BE THIC, RWAF, RWA1, RWA2
     1, RWA3, ST10, ST11, ST12, ST13, ISG1, ISG2, ØR ISG3.-/)
      GØ TØ 99
    7 WRITE(6,107)
  107 FØRMAT(/  4X,-THE WALL CØNSTRUCTIØN ØF A SEGMENT CANNØT BE IDENTIF
     1IED AS SING, EQUA, UNEQ, ØR BLAN.-/)
      GØ TØ 99
    8 WRITE(6,108)
  108 FØRMAT(/  4X,-THE TYPE ØF TEMPERATURE INPUT FØR A SEGMENT CANNØT B
     -1E IDENTIFIED AS THST, NØTH, THCN, ØR THIN.-/)
      GØ TØ 99
    9 WRITE(6,109)
  109 FØRMAT(/  4X,-THE WAFFLE GRID SPACING IS ZERØ.-/)
      GØ TØ 99
   10 WRITE(6,110)
  110 FØRMAT(/  4X,-THE RING SPACING IS ZERØ.-/)
      GØ TØ 99
   11 WRITE(6,111)
  111 FØRMAT(/  4X,-THE STRINGER SPACING IS ZERØ.-/)
      GØ TØ 99
   12 WRITE(6,112)
  112 FØRMAT(/  4X,-THE ØUTSIDE SHEET THICKNESS IS ZERØ.-/)
      GØ TØ 99
   13 WRITE(6,113)
  113 FØRMAT(/  4X,-THE CØRE THICKNESS IS ZERØ.-/)
      GØ TØ 99
   14 WRITE(6,114)
  114 FØRMAT(/  4X,-THE SHEET THICKNESS IS ZERØ.-/)
      GØ TØ 99
   15 WRITE(6,115)
  115 FØRMAT(/  4X,-THE INSIDE SHEET THICKNESS IS ZERØ.-/)
      GØ TØ 99
   16 WRITE(6,116)
  116 FØRMAT(/  4X,-THE K11 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   17 WRITE(6,117)
  117 FØRMAT(/  4X,-THE K12 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   18 WRITE(6,118)
  118 FØRMAT(/  4X,-THE K21 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   19 WRITE(6,119)
  119 FØRMAT(/  4X,-THE K22 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   20 WRITE(6,120)
  120 FØRMAT(/  4X,-THE K33 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   21 WRITE(6,121)
  121 FØRMAT(/  4X,-THE D11 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   22 WRITE(6,122)
  122 FØRMAT(/  4X,-THE D12 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   23 WRITE(6,123)
  123 FØRMAT(/  4X,-THE D21 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
   24 WRITE(6,124)
  124 FØRMAT(/  4X,-THE D22 STIFFNESS PARAMETER IS ZERØ.-/)
      GØ TØ 99
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 25 WRITE(6,125)
125 FØRMAT(/  4X,-THE D33 STIFFNESS PARAMETER IS ZERØ.-/)
    GØ TØ 99
 26 WRITE(6,126)
126 FØRMAT(/  4X,-THE ISØ-GRID SPACING IS ZERØ.-/)
    GØ TØ 99
 27 WRITE(6,127)
127 FØRMAT(/  4X,-THE LØAD INDICATØR CLUES CAN ØNLY BE ZERØ, BLANK, ØN
   1E, ØR FØUR.-/)
    GØ TØ 99
 28 WRITE(6,128)
128 FØRMAT(/  4X,-THE INTERPØLATED VALUE ØF TEMPERATURE FØR USE IN THE
   1 MATERIAL PRØPERTY TABLE IS LESS THAN THE SECØND TEMPERATURE VALUE
   2.-/)
    GØ TØ 99
 29 WRITE(6,129)
129 FØRMAT(/  4X,-THE INTERPØLATED VALUE ØF TEMPERATURE FØR USE IN THE
   1 MATERIAL PRØPERTY TABLE IS GREATER THAN THE LAST VALUE ØF TEMPERA
   2TURE.-/)
    GØ TØ 99
 30 WRITE(6,130)
130 FØRMAT(/  4X,-FØR KINEMATIC LINKS BETWEEN SEGMENTS, THE DEPENDENT
   1JØINT NUMBER MUST BE GREATER THAN THE INDEPENDENT JØINT NUMBER.-/)
    GØ TØ 99
 31 WRITE(6,131)
131 FØRMAT(/  4X,-J-TH JØINTS ØN SUCCESSIVE INTER-REGIØN KINEMATIC LIN
   1K CARDS MUST BE IN INCREASING ØRDER.-/)
    GØ TØ 99
 32 WRITE(6,132)
132 FØRMAT(/  4X,-TEMPERATURE VALUES (CØLUMNS 2 THRU END) IN THE MATER
   1IAL PRØPERTY TABLE MUST BE IN INCREASING ØRDER.-/)
    GØ TØ 99
 33 WRITE(6,133)
133 FØRMAT(/  4X,-FØR AN ANNULAR PLATE NEAR THE AXIS ØF REVØLUTIØN, TH
   1E END PØINT LØCATIØNS SHØULD BE IN A RATIØ BETWEEN .01 AND 100.-/)
    GØ TØ 99
 34 WRITE(6,134)
134 FØRMAT(/  4X,-DEGREES ØF FREEDØM ØF DEPENDENT (J) JØINT ØF KINEMAT
   1IC LINKS MUST BE --ZERØED ØUT--.-/)
    GØ TØ 99
 35 WRITE(6,135)
135 FØRMAT(/  4X,-TEMPERATURE AND LØAD CLUES ARE INCØNSISTENT.-/)
    GØ TØ 99
 36 WRITE(6,136)
136 FØRMAT(/  4X,-THE PRØGRAM CANNØT DETERMINE WHETHER THE PRØBLEM INP
   1UT IS LINEAR ØR NØN-LINEAR.-/)
    GØ TØ 99
 37 WRITE(6,137)
137 FØRMAT(/  4X,-THE PRØGRAM CAN EXECUTE ØNLY ØNE NØN-LINEAR PRØBLEM
   1PER DATA DECK.-/)
    GØ TØ 99
 38 WRITE(6,138)
138 FØRMAT(/  4X,-WARNING - IN A MULTI-LØAD CASE, SINGLE HARMØNIC PRØB
   1LEM, IF THE FIRST LØADING IS THERMAL, EACH SUCCESSIVE LØAD CASE WI
   2LL BE-/4X,-SUPERIMPØSED UPØN THE THERMAL SØLUTIØN.-/)
    GØ TØ 99
 39 WRITE(6,139)
139 FØRMAT(/  4X,-THE PRØGRAM CAN EXECUTE ØNLY ØNE THERMAL LØAD PRØBLE
   1M PER DATA DECK.-/)
    GØ TØ 99
 40 WRITE(6,140)
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140 FØRMAT(/  4X,-FØR NØN-LINEAR ANALYSIS, THE HARMØNIC MUST BE ZERØ.-
   -/)
    GØ TØ 99
 41 WRITE(6,141)
141 FØRMAT(/  4X,-THE STRESS CLUE FØR PHI INNER IS NØT STRI, SHEL, ISG
   1R, ØR WAFF.-/)
    GØ TØ 99
 42 WRITE(6,142)
142 FØRMAT(/  4X,-THE STRESS CLUE FØR PHI ØUTER IS NØT STRI, SHEL, ISG
   1R, ØR WAFF.-/)
    GØ TØ 99
 43 WRITE(6,143)
143 FØRMAT(/  4X,-THE STRESS CLUE FØR THETA INNER IS NØT RING, SHEL, I
   1SGR, ØR WAFF.-/)
    GØ TØ 99
 44 WRITE(6,144)
144 FØRMAT(/  4X,-THE STRESS CLUE FØR THETA ØUTER IS NØT RING, SHEL, I
   1SGR, ØR WAFF.-/)
    GØ TØ 99
 45 WRITE(6,145)
145 FØRMAT(/  4X,-THERE CAN BE ØNLY ØNE LØAD CASE ØN A MULTI-HARMØNIC
   1PRØBLEM.-/)
    GØ TØ 99
 46 WRITE(6,146)
146 FØRMAT(/  4X,-A MULTI-HARMØNIC PRØBLEM MUST BE LINEAR.-/)
    GØ TØ 99
 47 WRITE(6,147)
147 FØRMAT(/  4X,-IN A MULTI-HARMØNIC RUN, THE MAXIMUM NUMBER ØF HARMØ
   1NICS IS 25.-/4X,-(WARNING - THE DEBUGGING PRØGRAM WILL NØT BE ABLE
   2 TØ IDENTIFY THE INPUT HARMØNICS.)-/)
    GØ TØ 99
 48 WRITE(6,148)
148 FØRMAT(/  4X,-THE MAXIMUM NUMBER ØF THETA ANGLES TØ BE USED ARØUND
   1 THE CIRCUMFERENCE IS 36.-/)
    GØ TØ 99
 49 WRITE(6,149)
149 FØRMAT(/  4X,-PREVIØUS ERRØR NEGATES FURTHER CHECK.-/)
    GØ TØ 99
 50 WRITE(6,150)
150 FØRMAT(/  4X,-THERE IS AN INCØNSISTENCY IN THERMAL CLUES BETWEEN H
   1ARMØNIC INPUT.-/)
    GØ TØ 99
 51 WRITE(6,151)
151 FØRMAT(/  4X,-THE ST TABLE SIZE (NØ. ØF PØINTS) IS INCØNSISTENT BE
   1TWEEN HARMØNICS.-/)
    GØ TØ 99
 52 WRITE(6,152)
152 FØRMAT(/  4X,-THE MATERIAL PRØPERTY TABLE NAME IS UNIDENTIFIABLE F
   1ØR THIS SEGMENT. THERMAL LØADS CANNØT BE CHECKED AGAINST THE RANGE
   2 ØF THE-/4X,-MATERIAL PRØPERTY TABLE.-/)
    GØ TØ 99
 53 WRITE(6,153)
153 FØRMAT(/  4X,-THE NUMBER ØF REGIØN RINGS EXCEEDS 28.-/)
    GØ TØ 99
 54 WRITE(6,154)
154 FØRMAT(/  4X,-THE NUMBER ØF STRUCTURE RINGS EXCEEDS 28.-/)
    GØ TØ 99
 55 WRITE(6,155)
155 FØRMAT(/  4X,-THE NUMBER ØF GEØMETRY INPUT PØINTS EXCEEDS 14.-/)
    GØ TØ 99
 56 WRITE(6,156)
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  156 FØRMAT(/  64X,-SEGMENT PHI DIMENSIØN (TIC) IS ØUTSIDE THE Z VERSUS
     1 RØ INPUT TABLE.-/)
      GØ TØ 99
   57 WRITE(6,157)
  157 FØRMAT(/  63X,-SEGMENT PHI DIMENSIØN (STØP) IS ØUTSIDE THE Z VERSU
     1S RØ INPUT TABLE.-/)
   99 RETURN
      END                                                    2302870
 MAP,IS SYM,STARSS
LIB SYS$*MSFC$.
 CØPØUT TPF$.,PUR.
 XQT STARSS
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SECTION 2

SATELLITE-2S PROGRAM

2.1 INPUT: The SAT-2S program takes a point input and obtains a Fourier series representation for the points. Thus such loading as that caused by maneuvers (aerodynamic loading) which is usually known as point intensities, can be converted to STARS-2S Fourier input. The decision to create a separate SATELLITE program for this function, rather than a subroutine in STARS-2S was based on the following considerations:

(i) Only the user knows the accuracy with which the loads were calculated. Thus he alone is best able to decide the accuracy of the Fourier series representation required.

(ii) By checking the graphical output in SAT-2S the user can determine whether he has input enough points to accurately represent his load distribution in Fourier series form. The user is also able to see the Fourier series convergence trends and make better decisions on truncation.

(iii) The user is able to specify incremental summing of the Fourier series, thus eliminating STARS program runs with harmonics which are infinitesimal (but not zero) compared to the dominant harmonics.

The order of input for the SAT-2S is the following.

	Column	Format
I. Program Control Card		
A. Number of input points The number of input points must be between 20 and 720. As a general rule for rapidly varying distributions ("almost" point loads) a dense mesh of input points should be provided. A good representation is about a 12 to 15 point density per harmonic full wave.	1-3	I3

		Column	Format
B.	Type of series identification 0 = full Fourier series required 1 = cosine half series required 2 = sine half series required	4-6	I3
C.	First truncation harmonic This is the first point to which the series will be summed.	7-9	I3
D.	Second truncation harmonic This is the second point to which the series will be summed.	10-12	I3
E.	Total number of harmonics required ≤ 200 This is the total number of series terms which will be calculated. The final series will be summed to this number of terms.	13-15	I3
F.	Graphics clue 0 = no series plots 1 = include series plots	16-18	I3
G.	Series summing increment or multiple (INC) INC = 0, 1, -1: sums will involve all terms INC > 0: sums will consist of the following terms: zeroth + (INC) + (2INC) + (3INC) + ... INC < 0: sums will consist of the following terms: zeroth + first + (1+INC) + (1+2INC) + (1+3INC) + ...	19-21	I3

	Column	Format
II. Load Point Intensity Cards		
A. Point intensities (between 20 and 720) Use as many cards as necessary. The point intensities are assumed to be equally spaced, by the program, between 0° and 360°. The first input intensity should be that at θ_1 and the last should be that at 360°. The program will set the 0° intensity value equal to that at 360°. The intensities are signed (+ or -) values.	1-70	5E14.7

2.2 OUTPUT: The SAT-2S program output is the following:

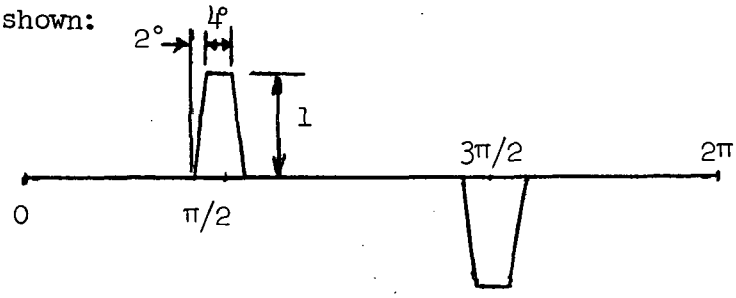
A. Title Page - The title of the program is printed along with pertinent information from the Program Control Card.

B. Harmonic Amplitudes - The Fourier series sine and cosine coefficients are printed next.

C. Fourier sums - The input points and the Fourier series representations are printed next. The increment value (if any used) is printed among the headings. The Fourier series will be summed at the first two input locations, and finally the total sum will be printed.

D. Graphics - If requested the graphical output will display the arrays of printed output (item C) on three charts - one for each truncation point. The input points are displayed as a solid line, and the Fourier series approximations as x's. The Fourier series approximations are charted at every degree (360 points) regardless of the input point number. In this way unexpected irregularities in the series between input points can be noted.

2.3 EXAMPLES, FLOW CHART, LISTING: A sample test problem is executed by the SAT-2S program. The loading considered is made up of two spikes as shown:



The program is required to find a 90 harmonic Fourier series representation of the load, and also to print a 30 and 60 harmonic estimate.

From the output it can be seen that all even terms are insignificant and INC could have been set equal to -2. The even terms should not be used in a STARS run. The graphical output exemplifies the fact that about 12 to 15 points per harmonic are necessary for an accurate calculation of the harmonic amplitude. The improvement in convergence is easily seen in increasing the number of series terms from 30 to 60. With a 720 point input, the 60th harmonic has a 720/60 = 12 point representation. Increasing the number of series terms to 90 improves convergence in the area of the spikes, but causes more eratic behavior around zero. The 90th harmonic has a 720/60 = 8 point representation. Thus the harmonic amplitudes from 61 to 90 are not calculated with appropriate accuracy.

SATELLITE-25

CONVERSION OF DISCRETE POINTS TO FOURIER SERIES INPUT FOR STARS-25 (STATICS)

VERSION DATE JULY 1, 1972

NO. OF PTS. = 720

SINE HALF-SERIES

TOTAL NO. OF HARMONICS = 90

SUMS AT 30, 60, 90

FOR INFORMATION CALL V. SVALBONAS
(516) 575-7701
P. OGILVIE

HARMONIC NO.	COSINE COEFFICIENT	SINE COEFFICIENT
0	.0000000	.0000000
1	.0000000	.6663325-01
2	.0000000	-.1320143-09
3	.0000000	-.6636631-01
4	.0000000	.2624417-09
5	.0000000	.6583455-01
6	.0000000	-.3897180-09
7	.0000000	-.6504222-01
8	.0000000	.5123189-09
9	.0000000	.6399561-01
10	.0000000	-.6287837-09
11	.0000000	-.6270303-01
12	.0000000	.7377322-09
13	.0000000	.6117468-01
14	.0000000	-.8378837-09
15	.0000000	-.5942260-01
16	.0000000	.9280741-09
17	.0000000	.5746051-01
18	.0000000	-.1007270-08
19	.0000000	-.5530368-01
20	.0000000	.1074584-08
21	.0000000	.5296878-01
22	.0000000	-.1129283-08
23	.0000000	-.5047372-01
24	.0000000	.1170798-08
25	.0000000	.4783745-01
26	.0000000	-.1198733-08
27	.0000000	-.4607981-01
28	.0000000	.1212866-08
29	.0000000	.4222129-01
30	.0000000	-.1213154-08
31	.0000000	-.3928288-01
32	.0000000	.1199730-08
33	.0000000	.3628583-01
34	.0000000	-.1172900-08
35	.0000000	-.3325145-01
36	.0000000	.1133138-08
37	.0000000	.3020094-01
38	.0000000	-.1081079-08
39	.0000000	-.2715516-01
40	.0000000	.1017508-08
41	.0000000	.2413445-01
42	.0000000	-.9433479-09
43	.0000000	-.2115845-01
44	.0000000	.8596464-09
45	.0000000	.1824593-01
46	.0000000	-.7675600-09
47	.0000000	-.1541463-01
48	.0000000	.6683373-09
49	.0000000	.1268110-01
50	.0000000	-.5633011-09
51	.0000000	-.1006056-01
52	.0000000	.4538297-09
53	.0000000	.7566840-02

54	.0000000	-.3413370-09
55	.0000000	-.5212204-02
56	.0000000	.2272537-09
57	.0000000	.3007323-02
58	.0000000	-.1130066-09
59	.0000000	-.9611913-03
60	.0000000	.2086968-17
61	.0000000	-.9189086-03
62	.0000000	.1104037-09
63	.0000000	.2627433-02
64	.0000000	-.2169018-09
65	.0000000	-.4160581-02
66	.0000000	.3182680-09
67	.0000000	.5516277-02
68	.0000000	-.4133686-09
69	.0000000	-.6694141-02
70	.0000000	.5011761-09
71	.0000000	.7695435-02
72	.0000000	-.5807817-09
73	.0000000	-.8523000-02
74	.0000000	.6514056-09
75	.0000000	.9181167-02
76	.0000000	-.7124058-09
77	.0000000	-.9675664-02
78	.0000000	.7632842-09
79	.0000000	.1001351-01
80	.0000000	-.8036905-09
81	.0000000	-.1020287-01
82	.0000000	.8334247-09
83	.0000000	.1025297-01
84	.0000000	-.8524360-09
85	.0000000	-.1017391-01
86	.0000000	.8608211-09
87	.0000000	.9976559-02
88	.0000000	-.8588191-09
89	.0000000	-.9672372-02
90	.0000000	.8468048-09

SERIES SUMS

PT. NO.	THETA	INPUT AMPLITUDE	30 HARMONICS	60 HARMONICS	90 HARMONICS
1	8.7266463-03	0.0000000	5.2823553-03	1.7380790-06	-3.3577510-03
2	1.7453293-02	0.0000000	1.0205034-02	5.0674176-06	-4.7482444-03
3	2.6179939-02	0.0000000	1.4432741-02	1.0602431-05	-3.3562959-03
4	3.4906585-02	0.0000000	1.7677302-02	1.7412115-05	3.5131555-06
5	4.3633231-02	0.0000000	1.9717214-02	2.3119819-05	3.3633223-03
6	5.2359878-02	0.0000000	2.0412706-02	2.4685007-05	4.7540637-03
7	6.1086524-02	0.0000000	1.9715269-02	1.9619684-05	3.3589482-03
8	6.9813170-02	0.0000000	1.7671026-02	7.2073570-06	-7.0479701-06
9	7.8539816-02	0.0000000	1.4417692-02	-1.0748763-05	-3.3730442-03
10	8.7266463-02	0.0000000	1.0175347-02	-2.9997183-05	-4.7657380-03
11	9.5993109-02	0.0000000	5.2316077-03	-4.4820766-05	-3.3657241-03
12	1.0471976-01	0.0000000	-7.7777268-05	-4.9710763-05	1.0626431-05
13	1.1344640-01	0.0000000	-5.3916315-03	-4.1247886-05	3.3869770-03

14	1.2217305-01	0.0000000	-1.0347807-02	-1.9580289-05	4.7833397-03
15	1.3089969-01	0.0000000	-1.4607754-02	1.1046387-05	3.3766653-03
16	1.3962634-01	0.0000000	-1.7879541-02	4.3001222-05	-1.4271191-05
17	1.4835299-01	0.0000000	-1.9937769-02	6.7146976-05	-3.4052077-03
18	1.5707963-01	0.0000000	-2.0639025-02	7.5429572-05	-4.8069786-03
19	1.6580628-01	0.0000000	-1.9931827-02	6.3450096-05	-3.3918397-03
20	1.7453293-01	0.0000000	-1.7860361-02	3.2222717-05	1.8005924-05
21	1.8325957-01	0.0000000	-1.4561760-02	-1.1505542-05	3.4278517-03
22	1.9198622-01	0.0000000	-1.0257075-02	-5.6617287-05	4.8368036-03
23	2.0071286-01	0.0000000	-5.2365320-03	-9.0426040-05	3.4113424-03
24	2.0943951-01	0.0000000	1.5993512-04	-1.0221758-04	-2.1855713-05
25	2.1816616-01	0.0000000	5.5655946-03	-8.6549578-05	-3.4550540-03
26	2.2689280-01	0.0000000	1.0611717-02	-4.5315080-05	-4.8730051-03
27	2.3561945-01	0.0000000	1.4952606-02	1.2142407-05	-3.4352971-03
28	2.4434610-01	0.0000000	1.8289162-02	7.1060129-05	2.5847479-05
29	2.5307274-01	0.0000000	2.0389391-02	1.1501918-04	3.4869922-03
30	2.6179939-01	0.0000000	2.1104446-02	1.3048863-04	4.9158185-03
31	2.7052603-01	0.0000000	2.0379108-02	1.1090111-04	3.4638580-03
32	2.7925268-01	0.0000000	1.8255968-02	5.9053316-05	-3.0010458-05
33	2.8797933-01	0.0000000	1.4873008-02	-1.2980185-05	-3.5238790-03
34	2.9670597-01	0.0000000	1.0454693-02	-8.6574900-05	-4.9655268-03
35	3.0543262-01	0.0000000	5.2971701-03	-1.4133563-04	-3.4972125-03
36	3.1415927-01	0.0000000	-2.5147280-04	-1.6071060-04	3.4376767-05
37	3.2288591-01	0.0000000	-5.8145752-03	-1.3690491-04	3.5659661-03
38	3.3161256-01	0.0000000	-1.1012335-02	-7.3656283-05	5.0224670-03
39	3.4033920-01	0.0000000	-1.5487598-02	1.4050727-05	3.5355840-03
40	3.4906585-01	0.0000000	-1.8930265-02	1.0344801-04	-3.8982049-05
41	3.5779250-01	0.0000000	-2.1098650-02	1.6985035-04	-3.6135482-03
42	3.6651914-01	0.0000000	-2.1836346-02	1.9342556-04	-5.0870346-03
43	3.7524579-01	0.0000000	-2.1083398-02	1.6502370-04	-3.5792360-03
44	3.8397244-01	0.0000000	-1.8881032-02	8.9374723-05	4.3866239-05
45	3.9269908-01	0.0000000	-1.5369536-02	-1.5396877-05	3.6669687-03
46	4.0142573-01	0.0000000	-1.0779425-02	-1.2202108-04	5.1596913-03
47	4.1015237-01	0.0000000	-5.4164167-03	-2.0112660-04	3.6288768-03
48	4.1887902-01	0.0000000	3.5879575-04	-2.2927539-04	-4.9074491-05
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52	4.5378561-01	0.0000000	1.9843264-02	1.4270926-04	5.4658285-05
53	4.6251225-01	0.0000000	2.2110232-02	2.3584553-04	3.7929816-03
54	4.7123890-01	0.0000000	2.2880818-02	2.6903520-04	5.3315032-03
55	4.7996554-01	0.0000000	2.2089000-02	2.2990624-04	3.7452155-03
56	4.8869219-01	0.0000000	1.9774725-02	1.2539090-04	-6.0676791-05
57	4.9741884-01	0.0000000	1.6082159-02	-1.9163975-05	-3.8665693-03
58	5.0614548-01	0.0000000	1.1250841-02	-1.6602596-04	-5.4319996-03
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62	5.4105207-01	0.0000000	-1.2339622-02	-1.4646797-04	5.5432958-03
63	5.4977871-01	0.0000000	-1.7282291-02	2.1763836-05	3.8894051-03
64	5.5850536-01	0.0000000	-2.1091611-02	1.9261662-04	-7.4303517-05
65	5.6723201-01	0.0000000	-2.3494368-02	3.1917710-04	-4.0380124-03
66	5.7595865-01	0.0000000	-2.4310337-02	3.6433588-04	-5.6663571-03
67	5.8468530-01	0.0000000	-2.3465578-02	3.1151183-04	-3.9732452-03
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77	6.7195176-01	0.0000000	2.5360200-02	4.2957362-04	4.3684716-03
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79	6.8940505-01	0.0000000	2.5321381-02	4.1918512-04	4.2811433-03
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81	7.0685835-01	0.0000000	1.8376500-02	-3.4303916-05	-4.5025909-03
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113	9.8611103-01	0.0000000	-3.6232811-02	1.1706454-03	-6.3127973-03
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115	1.0035643+00	0.0000000	-3.6125937-02	1.1334266-03	-6.0723779-03
116	1.0122910+00	0.0000000	-3.2233800-02	6.0493138-04	3.0962057-04
117	1.0210176+00	0.0000000	-2.5985144-02	-1.2910228-04	6.6916198-03
118	1.0297443+00	0.0000000	-1.7742981-02	-8.7881596-04	9.2776817-03
119	1.0384709+00	0.0000000	-8.0176844-03	-1.4365496-03	6.4159107-03
120	1.0471976+00	0.0000000	2.5633163-03	-1.6330186-03	-3.5634448-04
121	1.0559242+00	0.0000000	1.3294612-02	-1.3869398-03	-7.1286004-03
122	1.0646508+00	0.0000000	2.3438303-02	-7.3400017-04	-9.8673123-03
123	1.0733775+00	0.0000000	3.2273059-02	1.7429522-04	-6.8097930-03
124	1.0821041+00	0.0000000	3.9143606-02	1.1038154-03	4.1378024-04
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128	1.1170107+00	0.0000000	3.8608983-02	9.0441026-04	-4.8554490-04
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132	1.1519173+00	0.0000000	-4.1015212-03	-2.6070977-03	5.7693745-04
133	1.1606440+00	0.0000000	-1.7400913-02	-2.2027433-03	8.9503233-03
134	1.1693706+00	0.0000000	-3.0029038-02	-1.1356560-03	1.2308777-02
135	1.1780972+00	0.0000000	-4.1077829-02	3.5563471-04	8.4235689-03
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138	1.2042772+00	0.0000000	-5.7046916-02	3.4363953-03	-1.3458989-02
139	1.2130038+00	0.0000000	-5.4922066-02	2.8916607-03	-9.1737126-03
140	1.2217305+00	0.0000000	-4.8785245-02	1.4595144-03	8.5534787-04
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144	1.2566371+00	0.0000000	7.4584225-03	-4.7174518-03	-1.0759937-03
145	1.2653637+00	0.0000000	2.5258416-02	-3.9464895-03	-1.2237588-02
146	1.2740904+00	0.0000000	4.2292653-02	-1.9292424-03	-1.6647354-02
147	1.2828170+00	0.0000000	5.7316022-02	9.1425196-04	-1.1216081-02
148	1.2915436+00	0.0000000	6.9141815-02	3.8724003-03	1.3948566-03
149	1.3002703+00	0.0000000	7.6723260-02	6.1029906-03	1.4005796-02
150	1.3089969+00	0.0000000	7.9230943-02	6.8522725-03	1.8946217-02
151	1.3177236+00	0.0000000	7.6121226-02	5.6804229-03	1.2651840-02
152	1.3264502+00	0.0000000	6.7191133-02	2.6330121-03	-1.8823524-03
153	1.3351769+00	0.0000000	5.2615803-02	-1.6958852-03	-1.6416546-02
154	1.3439035+00	0.0000000	3.2965488-02	-6.2423307-03	-2.2042082-02
155	1.3526302+00	0.0000000	9.2001843-03	-9.6938922-03	-1.4530603-02
156	1.3613568+00	0.0000000	-1.7358815-02	-1.0817511-02	2.6877549-03
157	1.3700835+00	0.0000000	-4.5079814-02	-8.8243131-03	1.9906115-02
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159	1.3875368+00	0.0000000	-9.6374773-02	3.7235422-03	1.7078764-02
160	1.3962634+00	0.0000000	-1.1585836-01	1.1628806-02	-4.1786103-03
161	1.4049900+00	0.0000000	-1.2853471-01	1.7698739-02	-2.5435988-02
162	1.4137167+00	0.0000000	-1.3256875-01	1.9541985-02	-3.3241527-02
163	1.4224433+00	0.0000000	-1.2640645-01	1.5375396-02	-2.0654374-02
164	1.4311700+00	0.0000000	-1.0887280-01	4.7054641-03	7.4924673-03
165	1.4398966+00	0.0000000	-7.9254282-02	-1.1122622-02	3.5639313-02
166	1.4486233+00	0.0000000	-3.7360691-02	-2.8653476-02	4.5181128-02
167	1.4573499+00	0.0000000	1.6437412-02	-4.2435844-02	2.5407436-02
168	1.4660766+00	0.0000000	8.1198537-02	-4.5566720-02	-1.7899144-02
169	1.4748032+00	0.0000000	1.5542860-01	-3.0628202-02	-6.1205729-02
170	1.4835299+00	0.0000000	2.3712759-01	9.1026942-03	-7.0972818-02
171	1.4922565+00	0.0000000	3.2386291-01	7.8358549-02	-1.7542708-02
172	1.5009832+00	0.0000000	4.1286618-01	1.7872525-01	1.1107531-01
173	1.5097098+00	2.5000000-01	5.0114895-01	3.0784737-01	3.0219334-01
174	1.5184364+00	5.0000000-01	5.8563212-01	4.5917294-01	5.2193777-01
175	1.5271631+00	7.5000000-01	6.6328223-01	6.2233373-01	7.2801609-01
176	1.5358897+00	1.0000000+00	7.3124829-01	7.8415243-01	8.8598629-01
177	1.5446164+00	1.0000000+00	7.8699202-01	9.3015850-01	9.8145650-01
178	1.5533430+00	1.0000000+00	8.2840498-01	1.0464005+00	1.0225655+00
179	1.5620697+00	1.0000000+00	8.5390648-01	1.1212824+00	1.0318516+00
180	1.5707963+00	1.0000000+00	8.6251750-01	1.1471364+00	1.0318516+00
181	1.5795230+00	1.0000000+00	8.5390649-01	1.1212824+00	1.0318516+00

182	1.5882496+00	1.0000000+00	8.2840499-01	1.0464006+00	1.0225655+00
183	1.5969763+00	1.0000000+00	7.8699205-01	9.3015856-01	9.8145653-01
184	1.6857029+00	1.0000000+00	7.3124832-01	7.8415249-01	8.8598635-01
185	1.6144296+00	7.5000000-01	6.6328226-01	6.2233380-01	7.2801618-01
186	1.6231562+00	5.0000000-01	5.8563216-01	4.5917301-01	5.2193787-01
187	1.6318828+00	2.5000000-01	5.0114900-01	3.0784743-01	3.0219343-01
188	1.6406095+00	0.0000000	4.1286622-01	1.7872530-01	1.1107539-01
189	1.6893361+00	0.0000000	3.2386295-01	7.8358588-02	-1.7542667-02
190	1.6580628+00	0.0000000	2.3712763-01	9.1027188-03	-7.0972810-02
191	1.6667894+00	0.0000000	1.5542863-01	-3.0628191-02	-6.1205745-02
192	1.6755161+00	0.0000000	8.1198568-02	-4.5566719-02	-1.7899165-02
193	1.6842427+00	0.0000000	1.6437439-02	-4.2435848-02	2.5407421-02
194	1.6929694+00	0.0000000	-3.7360670-02	-2.8653484-02	4.5181127-02
195	1.7016960+00	0.0000000	-7.9254267-02	-1.1122630-02	3.5639323-02
196	1.7104227+00	0.0000000	-1.0887280-01	4.7054578-03	7.4924815-03
197	1.7191493+00	0.0000000	-1.2640645-01	1.5375393-02	-2.0654365-02
198	1.7278760+00	0.0000000	-1.3256876-01	1.9541985-02	-3.3241527-02
199	1.7366026+00	0.0000000	-1.2853472-01	1.7698741-02	-2.5435996-02
200	1.7453293+00	0.0000000	-1.1585837-01	1.1628809-02	-4.1786210-03
201	1.7540559+00	0.0000000	-9.6374784-02	3.7235458-03	1.7078757-02
202	1.7627825+00	0.0000000	-7.2092131-02	-3.6810563-03	2.6446286-02
203	1.7715092+00	0.0000000	-4.5079827-02	-8.8243114-03	1.9906122-02
204	1.7802358+00	0.0000000	-1.7358827-02	-1.0817511-02	2.6877635-03
205	1.7889625+00	0.0000000	9.2001731-03	-9.6938934-03	-1.4530597-02
206	1.7976891+00	0.0000000	3.2965478-02	-6.2423327-03	-2.2042083-02
207	1.8064158+00	0.0000000	5.2615796-02	-1.6958873-03	-1.6416552-02
208	1.8151424+00	0.0000000	6.7191130-02	2.6330103-03	-1.8823597-03
209	1.8238691+00	0.0000000	7.6121225-02	5.6804219-03	1.2651835-02
210	1.8325957+00	0.0000000	7.9230944-02	6.8522724-03	1.8946218-02
211	1.8913224+00	0.0000000	7.6723264-02	6.1029913-03	1.4005801-02
212	1.8500490+00	0.0000000	6.9141821-02	3.8724016-03	1.3948629-03
213	1.8587757+00	0.0000000	5.7316029-02	9.1425337-04	-1.1216077-02
214	1.8675023+00	0.0000000	4.2292661-02	-1.9292413-03	-1.6647355-02
215	1.8762289+00	0.0000000	2.5258424-02	-3.9464889-03	-1.2237593-02
216	1.8849556+00	0.0000000	7.4584304-03	-4.7174518-03	-1.0759992-03
217	1.8936822+00	0.0000000	-9.8845265-03	-4.1844153-03	1.0085596-02
218	1.9024089+00	0.0000000	-2.5645153-02	-2.6256499-03	1.4871720-02
219	1.9111355+00	0.0000000	-3.8861108-02	-5.4907396-04	1.0884414-02
220	1.9198622+00	0.0000000	-4.8785242-02	1.4595136-03	8.5535279-04
221	1.9285888+00	0.0000000	-5.4922066-02	2.8916602-03	-9.1737097-03
222	1.9373155+00	0.0000000	-5.7046917-02	3.4363953-03	-1.3458990-02
223	1.9460421+00	0.0000000	-5.5207407-02	3.0391167-03	-9.8155445-03
224	1.9547688+00	0.0000000	-4.9707774-02	1.8906178-03	-6.9598978-04
225	1.9634954+00	0.0000000	-4.1077834-02	3.5563546-04	8.4235665-03
226	1.9722221+00	0.0000000	-3.0029044-02	-1.1356553-03	1.2308777-02
227	1.9809487+00	0.0000000	-1.7400919-02	-2.2027430-03	8.9503268-03
228	1.9896753+00	0.0000000	-4.1015270-03	-2.6070977-03	5.7694150-04
229	1.9984020+00	0.0000000	8.9540224-03	-2.3005628-03	-7.7964452-03
230	2.0071286+00	0.0000000	2.0903130-02	-1.4214351-03	-1.1354890-02
231	2.0158553+00	0.0000000	3.0989646-02	-2.4362512-04	-8.2361909-03
232	2.0245819+00	0.0000000	3.8608982-02	9.0440976-04	-4.8554862-04
233	2.0333086+00	0.0000000	4.3341854-02	1.7280384-03	7.2650949-03
234	2.0420352+00	0.0000000	4.4974906-02	2.0392013-03	1.0551843-02
235	2.0507619+00	0.0000000	4.3507341-02	1.7963263-03	7.6373573-03
236	2.0594885+00	0.0000000	3.9143609-02	1.1038158-03	4.1378368-04
237	2.0682152+00	0.0000000	3.2273063-02	1.7429569-04	-6.8097912-03

238	2.0769418+00	0.0000000	2.3438307-02	-7.3399978-04	-9.8673131-03
239	2.0856685+00	0.0000000	1.3294617-02	-1.3869395-03	-7.1286032-03
240	2.0943951+00	0.0000000	2.5633209-03	-1.6330186-03	-3.5634767-04
241	2.1031217+00	0.0000000	-8.0176805-03	-1.4365498-03	6.4159090-03
242	2.1118484+00	0.0000000	-1.7742978-02	-8.7881630-04	9.2776824-03
243	2.1205750+00	0.0000000	-2.5985142-02	-1.2910266-04	6.6916225-03
244	2.1293017+00	0.0000000	-3.2233799-02	6.0493105-04	3.0962355-04
245	2.1380283+00	0.0000000	-3.6125937-02	1.1334264-03	-6.0723764-03
246	2.1467550+00	0.0000000	-3.7465722-02	1.3322121-03	-8.7652814-03
247	2.1554816+00	0.0000000	-3.6232813-02	1.1706456-03	-6.3127999-03
248	2.1642083+00	0.0000000	-3.2578953-02	7.1354995-04	-2.7107121-04
249	2.1729349+00	0.0000000	-2.6813345-02	9.8398248-05	5.7706584-03
250	2.1816616+00	0.0000000	-1.9378067-02	-5.0482629-04	8.3166223-03
251	2.1903882+00	0.0000000	-1.0815377-02	-9.3967876-04	5.9817955-03
252	2.1991149+00	0.0000000	-1.7292417-03	-1.1029792-03	2.3886290-04
253	2.2078415+00	0.0000000	7.2562583-03	-9.6835585-04	-5.5040707-03
254	2.2165681+00	0.0000000	1.5538840-02	-5.8850065-04	-7.9212296-03
255	2.2252948+00	0.0000000	2.2577502-02	-7.6820894-05	-5.6906145-03
256	2.2340214+00	0.0000000	2.7927045-02	4.2556132-04	-2.1165521-04
257	2.2427481+00	0.0000000	3.1265476-02	7.8807575-04	5.2673050-03
258	2.2514747+00	0.0000000	3.2412649-02	9.2403388-04	7.5708423-03
259	2.2602014+00	0.0000000	3.1339121-02	8.1067612-04	5.4329772-03
260	2.2689280+00	0.0000000	2.8164836-02	4.9149533-04	1.8844226-04
261	2.2776547+00	0.0000000	2.3147945-02	6.1227097-05	-5.0560936-03
262	2.2863813+00	0.0000000	1.6664711-02	-3.6163978-04	-7.2588595-03
263	2.2951080+00	0.0000000	9.1819831-03	-6.6701532-04	-5.2038832-03
264	2.3038346+00	0.0000000	1.2242335-03	-7.8142506-04	-1.6845835-04
265	2.3125613+00	0.0000000	-6.6625873-03	-6.8517837-04	4.8669673-03
266	2.3212879+00	0.0000000	-1.3947910-02	-4.1462233-04	6.9799438-03
267	2.3300145+00	0.0000000	-2.0151677-02	-4.9690163-05	4.9993022-03
268	2.3387412+00	0.0000000	-2.4875461-02	3.0924104-04	1.5111198-04
269	2.3474678+00	0.0000000	-2.7827568-02	5.6860326-04	-4.6970790-03
270	2.3561945+00	0.0000000	-2.8840599-02	6.6569605-04	-6.7297346-03
271	2.3649211+00	0.0000000	-2.7880409-02	5.8345435-04	-4.8159506-03
272	2.3736478+00	0.0000000	-2.5046056-02	3.5255842-04	-1.3594010-04
273	2.3823744+00	0.0000000	-2.0560864-02	4.0984228-05	4.5440712-03
274	2.3911011+00	0.0000000	-1.4755367-02	-2.6564428-04	6.5046361-03
275	2.3998277+00	0.0000000	-8.0433933-03	-4.8731440-04	4.6511276-03
276	2.4085544+00	0.0000000	-8.9298221-04	-5.7024885-04	1.2257588-04
277	2.4172810+00	0.0000000	6.2058392-03	-4.9964744-04	-4.4059766-03
278	2.4260077+00	0.0000000	1.2774239-02	-3.0161432-04	-6.3016585-03
279	2.4347343+00	0.0000000	1.8376499-02	-3.4304076-05	-4.5025928-03
280	2.4434610+00	0.0000000	2.2648565-02	2.2886928-04	-1.1072545-04
281	2.4521876+00	0.0000000	2.5321381-02	4.1918504-04	4.2811426-03
282	2.4609142+00	0.0000000	2.6237536-02	4.9036275-04	6.1182980-03
283	2.4696409+00	0.0000000	2.5360201-02	4.2957369-04	4.3684734-03
284	2.4783675+00	0.0000000	2.2773885-02	2.5916646-04	1.0015102-04
285	2.4870942+00	0.0000000	1.8677061-02	2.9106092-05	-4.1681720-03
286	2.4958208+00	0.0000000	1.3367275-02	-1.9744615-04	-5.9524434-03
287	2.5045475+00	0.0000000	7.2198311-03	-3.6130875-04	-4.2471934-03
288	2.5132741+00	0.0000000	6.6154473-04	-4.2258427-04	-9.0658342-05
289	2.5220008+00	0.0000000	-5.8585954-03	-3.7017644-04	4.0658774-03
290	2.5307274+00	0.0000000	-1.1899883-02	-2.2330626-04	5.8023051-03
291	2.5394541+00	0.0000000	-1.7059407-02	-2.5014456-05	4.1374188-03
292	2.5481807+00	0.0000000	-2.0998674-02	1.7026377-04	8.2087356-05
293	2.5569074+00	0.0000000	-2.3465579-02	3.1151177-04	-3.9732447-03

294	2.5656340+00	0.0000000	-2.4310339-02	3.6433588-04	-5.6663579-03
295	2.5743606+00	0.0000000	-2.3499437D-02	3.1917716-04	-4.0380141-03
296	2.5830873+00	0.0000000	-2.1091613-02	1.9261673-04	-7.4305050-05
297	2.5918139+00	0.0000000	-1.7282294-02	2.1763954-05	3.8894046-03
298	2.6005406+00	0.0000000	-1.2339624-02	-1.4646787-04	5.5432966-03
299	2.6092672+00	0.0000000	-6.6104093-03	-2.6813850-04	3.9480090-03
300	2.6179939+00	0.0000000	-4.9092080-04	-3.1365805-04	6.7200013-05
301	2.6267205+00	0.0000000	5.6002971-03	-2.7484575-04	-3.8136097-03
302	2.6354472+00	0.0000000	1.1250840-02	-1.6602605-04	-5.4320004-03
303	2.6441738+00	0.0000000	1.6082158-02	-1.9164082-05	-3.8665709-03
304	2.6529005+00	0.0000000	1.9774725-02	1.2539080-04	-6.0678205-05
305	2.6616271+00	0.0000000	2.2089000-02	2.2990618-04	3.7452151-03
306	2.6703538+00	0.0000000	2.2880819-02	2.6903520-04	5.3315040-03
307	2.6790804+00	0.0000000	2.2110234-02	2.3584557-04	3.7929831-03
308	2.6878070+00	0.0000000	1.9843266-02	1.4270935-04	5.4659643-05
309	2.6965337+00	0.0000000	1.6246525-02	1.7075932-05	-3.6836645-03
310	2.7052603+00	0.0000000	1.1575108-02	-1.0650238-04	-5.2409745-03
311	2.7139870+00	0.0000000	6.1546537-03	-1.9580433-04	-3.7266275-03
312	2.7227136+00	0.0000000	3.5879763-04	-2.2927539-04	-4.9075798-05
313	2.7314403+00	0.0000000	-5.4164152-03	-2.0112664-04	3.6284765-03
314	2.7401669+00	0.0000000	-1.0779424-02	-1.2202116-04	5.1596921-03
315	2.7488936+00	0.0000000	-1.5369536-02	-1.5396968-05	3.6669702-03
316	2.7576202+00	0.0000000	-1.8881032-02	8.9374645-05	4.3867497-05
317	2.7663469+00	0.0000000	-2.1083399-02	1.6502365-04	-3.5792358-03
318	2.7750735+00	0.0000000	-2.1836347-02	1.9342556-04	-5.0870354-03
319	2.7838002+00	0.0000000	-2.1098652-02	1.6985039-04	-3.6135497-03
320	2.7925268+00	0.0000000	-1.8930267-02	1.0344809-04	-3.8983261-05
321	2.8012534+00	0.0000000	-1.5487600-02	1.4050812-05	3.5355837-03
322	2.8099801+00	0.0000000	-1.1012337-02	-7.3656211-05	5.0224679-03
323	2.8187067+00	0.0000000	-5.8145772-03	-1.3690487-04	3.5659675-03
324	2.8274334+00	0.0000000	-2.5147447-04	-1.6071060-04	3.4377935-05
325	2.8361600+00	0.0000000	5.2971688-03	-1.4133567-04	-3.4972122-03
326	2.8448867+00	0.0000000	1.0454692-02	-8.6574968-05	-4.9655277-03
327	2.8536133+00	0.0000000	1.4873008-02	-1.2980263-05	-3.5238804-03
328	2.8623400+00	0.0000000	1.8255969-02	5.9053248-05	-3.0011584-05
329	2.8710666+00	0.0000000	2.0379109-02	1.1090107-04	3.4638578-03
330	2.8797933+00	0.0000000	2.1104447-02	1.3048863-04	4.9158193-03
331	2.8885199+00	0.0000000	2.0389393-02	1.1501922-04	3.4869935-03
332	2.8972466+00	0.0000000	1.8289164-02	7.1060193-05	2.5848564-05
333	2.9059732+00	0.0000000	1.4952608-02	1.2142480-05	-3.4352969-03
334	2.9146998+00	0.0000000	1.0611719-02	-4.5315017-05	-4.8730060-03
335	2.9234265+00	0.0000000	5.5655965-03	-8.6549541-05	-3.4550553-03
336	2.9321531+00	0.0000000	1.5993662-04	-1.0221758-04	-2.1856761-05
337	2.9408798+00	0.0000000	-5.2365309-03	-9.0426074-05	3.4113423-03
338	2.9496064+00	0.0000000	-1.0257074-02	-5.6617347-05	4.8368044-03
339	2.9583331+00	0.0000000	-1.4561760-02	-1.1505610-05	3.4278530-03
340	2.9670597+00	0.0000000	-1.7860361-02	3.2222658-05	1.8006935-05
341	2.9757864+00	0.0000000	-1.9931827-02	6.3450062-05	-3.3918396-03
342	2.9845130+00	0.0000000	-2.0639027-02	7.5429571-05	-4.8069794-03
343	2.9932397+00	0.0000000	-1.9937770-02	6.7147009-05	-3.4052090-03
344	3.0019663+00	0.0000000	-1.7879543-02	4.3001278-05	-1.4272166-05
345	3.0106930+00	0.0000000	-1.4607756-02	1.1046451-05	3.3766652-03
346	3.0194196+00	0.0000000	-1.0347809-02	-1.9580233-05	4.7833406-03
347	3.0281463+00	0.0000000	-5.3916331-03	-4.1247854-05	3.3869783-03
348	3.0368729+00	0.0000000	-7.7778618-05	-4.9710763-05	1.0627373-05
349	3.0455995+00	0.0000000	5.2316067-03	-4.4820797-05	-3.3657240-03

350	3.0543262+00	0.0000000	1.0175346-02	-2.9997236-05	-4.7657388-03
351	3.0630528+00	0.0000000	1.4417692-02	-1.0748823-05	-3.3730454-03
352	3.0717795+00	0.0000000	1.7671026-02	7.2073047-06	-7.0488796-06
353	3.0805061+00	0.0000000	1.9715270-02	1.9619654-05	3.3589482-03
354	3.0892328+00	0.0000000	2.0412707-02	2.4685007-05	4.7540645-03
355	3.0979594+00	0.0000000	1.9717215-02	2.3119848-05	3.3633235-03
356	3.1066861+00	0.0000000	1.7677303-02	1.7412165-05	3.5140337-06
357	3.1154127+00	0.0000000	1.4432743-02	1.0602489-05	-3.3562959-03
358	3.1241394+00	0.0000000	1.0205036-02	5.0674672-06	-4.7482453-03
359	3.1328660+00	0.0000000	5.2823568-03	1.7381076-06	-3.3577522-03
360	3.1415927+00	0.0000000	1.2148725-09	3.2677488-13	-8.4799640-10
361	3.1503193+00	0.0000000	-5.2823544-03	-1.7381065-06	3.3577510-03
362	3.1590459+00	0.0000000	-1.0205033-02	-5.0674652-06	4.7482453-03
363	3.1677726+00	0.0000000	-1.4432741-02	-1.0602486-05	3.3562971-03
364	3.1764992+00	0.0000000	-1.7677302-02	-1.7412162-05	-3.5123367-06
365	3.1852259+00	0.0000000	-1.9717215-02	-2.3119846-05	-3.3633223-03
366	3.1939525+00	0.0000000	-2.0412707-02	-2.4685007-05	-4.7540645-03
367	3.2026792+00	0.0000000	-1.9715271-02	-1.9619658-05	-3.3589494-03
368	3.2114058+00	0.0000000	-1.7671027-02	-7.2073119-06	7.0471795-06
369	3.2201325+00	0.0000000	-1.4417694-02	1.0748815-05	3.3730442-03
370	3.2288591+00	0.0000000	-1.0175348-02	2.9997227-05	4.7657388-03
371	3.2375858+00	0.0000000	-5.2316090-03	4.4820792-05	3.3657252-03
372	3.2463124+00	0.0000000	7.7776175-05	4.9710763-05	-1.0625668-05
373	3.2550391+00	0.0000000	5.3916308-03	4.1247861-05	-3.3869770-03
374	3.2637657+00	0.0000000	1.0347807-02	1.9580245-05	-4.7833406-03
375	3.2724923+00	0.0000000	1.4607754-02	-1.1046436-05	-3.3766664-03
376	3.2812190+00	0.0000000	1.7879542-02	-4.3001265-05	1.4270454-05
377	3.2899456+00	0.0000000	1.9937770-02	-6.7147001-05	3.4052078-03
378	3.2986723+00	0.0000000	2.0639027-02	-7.5429572-05	4.8069794-03
379	3.3073989+00	0.0000000	1.9931828-02	-6.3450072-05	3.3918408-03
380	3.3161256+00	0.0000000	1.7860362-02	-3.2222677-05	-1.8005212-05
381	3.3248522+00	0.0000000	1.4561762-02	1.1505589-05	-3.4278517-03
382	3.3335789+00	0.0000000	1.0257076-02	5.6617328-05	-4.8368044-03
383	3.3423055+00	0.0000000	5.2365333-03	9.0426063-05	-3.4113435-03
384	3.3510322+00	0.0000000	-1.5993413-04	1.0221758-04	2.1855027-05
385	3.3597588+00	0.0000000	-5.5655941-03	8.6549554-05	3.4550541-03
386	3.3684855+00	0.0000000	-1.0611717-02	4.5315041-05	4.8730060-03
387	3.3772121+00	0.0000000	-1.4952606-02	-1.2142452-05	3.4352982-03
388	3.3859387+00	0.0000000	-1.8289163-02	-7.1060168-05	-2.5846816-05
389	3.3946654+00	0.0000000	-2.0389392-02	-1.1501921-04	-3.4869923-03
390	3.4033920+00	0.0000000	-2.1104447-02	-1.3048863-04	-4.9158193-03
391	3.4121187+00	0.0000000	-2.0379109-02	-1.1090109-04	-3.4638591-03
392	3.4208453+00	0.0000000	-1.8255970-02	-5.9053278-05	3.0009819-05
393	3.4295720+00	0.0000000	-1.4873010-02	1.2980229-05	3.5238792-03
394	3.4382986+00	0.0000000	-1.0454694-02	8.6574938-05	4.9655277-03
395	3.4470253+00	0.0000000	-5.2971713-03	1.4133566-04	3.4972135-03
396	3.4557519+00	0.0000000	2.5147191-04	1.6071060-04	-3.4376152-05
397	3.4644786+00	0.0000000	5.8145747-03	1.3690489-04	-3.5659663-03
398	3.4732052+00	0.0000000	1.1012335-02	7.3656247-05	-5.0224679-03
399	3.4819319+00	0.0000000	1.5487598-02	-1.4050769-05	-3.5355850-03
400	3.4906585+00	0.0000000	1.8930265-02	-1.0344805-04	3.8981455-05
401	3.4993851+00	0.0000000	2.1098651-02	-1.6985037-04	3.6135484-03
402	3.5081118+00	0.0000000	2.1836347-02	-1.9342556-04	5.0870354-03
403	3.5168384+00	0.0000000	2.1083399-02	-1.6502368-04	3.5792370-03
404	3.5255651+00	0.0000000	1.8881033-02	-8.9374687-05	-4.3865667-05
405	3.5342917+00	0.0000000	1.5369538-02	1.5396917-05	-3.6669689-03

406	3.5430184+00	0.0000000	1.0779426-02	1.2202112-04	-5.1596921-03
407	3.5517450+00	0.0000000	5.4164178-03	2.0112662-04	-3.6284778-03
408	3.5604717+00	0.0000000	-3.5879496-04	2.2927539-04	4.9073940-05
409	3.5691983+00	0.0000000	-6.1546511-03	1.9580436-04	3.7266262-03
410	3.5779250+00	0.0000000	-1.1575106-02	1.0650244-04	5.2409745-03
411	3.5866516+00	0.0000000	-1.6246523-02	-1.7075872-05	3.6836658-03
412	3.5953783+00	0.0000000	-1.9843264-02	-1.4270930-04	-5.4657755-05
413	3.6041049+00	0.0000000	-2.2110233-02	-2.3584555-04	-3.7929818-03
414	3.6128315+00	0.0000000	-2.2880819-02	-2.6903520-04	-5.3315040-03
415	3.6215582+00	0.0000000	-2.2089001-02	-2.2990622-04	-3.7452165-03
416	3.6302848+00	0.0000000	-1.9774726-02	-1.2539086-04	6.0676282-05
417	3.6390115+00	0.0000000	-1.6082160-02	1.9164013-05	3.8665696-03
418	3.6477381+00	0.0000000	-1.1250842-02	1.6602599-04	5.4320004-03
419	3.6564648+00	0.0000000	-5.6002997-03	2.7484572-04	3.8136110-03
420	3.6651914+00	0.0000000	4.9091799-04	3.1365805-04	-6.7198052-05
421	3.6739181+00	0.0000000	6.6104066-03	2.6813853-04	-3.9480077-03
422	3.6826447+00	0.0000000	1.2339622-02	1.4646794-04	-5.5432966-03
423	3.6913714+00	0.0000000	1.7282292-02	-2.1763873-05	-3.8894061-03
424	3.7000980+00	0.0000000	2.1091612-02	-1.9261666-04	7.4303048-05
425	3.7088247+00	0.0000000	2.3494369-02	-3.1917712-04	4.0380127-03
426	3.7175513+00	0.0000000	2.4310339-02	-3.6433588-04	5.6663579-03
427	3.7262780+00	0.0000000	2.3465579-02	-3.1151181-04	3.9732461-03
428	3.7350046+00	0.0000000	2.0998675-02	-1.7026385-04	-8.2085307-05
429	3.7437312+00	0.0000000	1.7059410-02	2.5014362-05	-4.1374173-03
430	3.7524579+00	0.0000000	1.1899885-02	2.2330618-04	-5.8023051-03
431	3.7611845+00	0.0000000	5.8585982-03	3.7017639-04	-4.0658789-03
432	3.7699112+00	0.0000000	-6.6154173-04	4.2258428-04	9.0656242-05
433	3.7786378+00	0.0000000	-7.2198281-03	3.6130880-04	4.2471919-03
434	3.7873645+00	0.0000000	-1.3367273-02	1.9744624-04	5.9524435-03
435	3.7960911+00	0.0000000	-1.8677058-02	-2.9105983-05	4.1681736-03
436	3.8048178+00	0.0000000	-2.2773884-02	-2.5916636-04	-1.0014886-04
437	3.8135444+00	0.0000000	-2.5360201-02	-4.2957363-04	-4.3684719-03
438	3.8222711+00	0.0000000	-2.6237536-02	-4.9036275-04	-6.1182980-03
439	3.8309977+00	0.0000000	-2.5321382-02	-4.1918510-04	-4.2811442-03
440	3.8397244+00	0.0000000	-2.2648566-02	-2.2886939-04	1.1072323-04
441	3.8484510+00	0.0000000	-1.8376501-02	3.4303950-05	4.5025912-03
442	3.8571776+00	0.0000000	-1.2774242-02	3.0161421-04	6.3016585-03
443	3.8659043+00	0.0000000	-6.2058423-03	4.9964737-04	4.4059782-03
444	3.8746309+00	0.0000000	8.9297893-04	5.7024885-04	-1.2257360-04
445	3.8833576+00	0.0000000	8.0433901-03	4.8731447-04	-4.6511260-03
446	3.8920842+00	0.0000000	1.4755364-02	2.6564440-04	-6.5046361-03
447	3.9008109+00	0.0000000	2.0560862-02	-4.0984081-05	-4.5440728-03
448	3.9095375+00	0.0000000	2.5046055-02	-3.5255829-04	1.3593774-04
449	3.9182642+00	0.0000000	2.7880408-02	-5.8345428-04	4.8159489-03
450	3.9269908+00	0.0000000	2.8840599-02	-6.6569606-04	6.7297347-03
451	3.9357175+00	0.0000000	2.7827569-02	-5.6860334-04	4.6970808-03
452	3.9444441+00	0.0000000	2.4875463-02	-3.0924119-04	-1.5110953-04
453	3.9531708+00	0.0000000	2.0151680-02	4.9689991-05	-4.9993004-03
454	3.9618974+00	0.0000000	1.3947913-02	4.1462217-04	-6.9799439-03
455	3.9706240+00	0.0000000	6.6625908-03	6.8517827-04	-4.8669691-03
456	3.9793507+00	0.0000000	-1.2242299-03	7.8142506-04	1.6845581-04
457	3.9880773+00	0.0000000	-9.1819796-03	6.6701542-04	5.2038814-03
458	3.9968040+00	0.0000000	-1.6664707-02	3.6163995-04	7.2588596-03
459	4.0055306+00	0.0000000	-2.3147942-02	-6.1226894-05	5.0560954-03
460	4.0142573+00	0.0000000	-2.8164834-02	-4.9149515-04	-1.8843961-04
461	4.0229839+00	0.0000000	-3.1339120-02	-8.1067601-04	-5.4329754-03

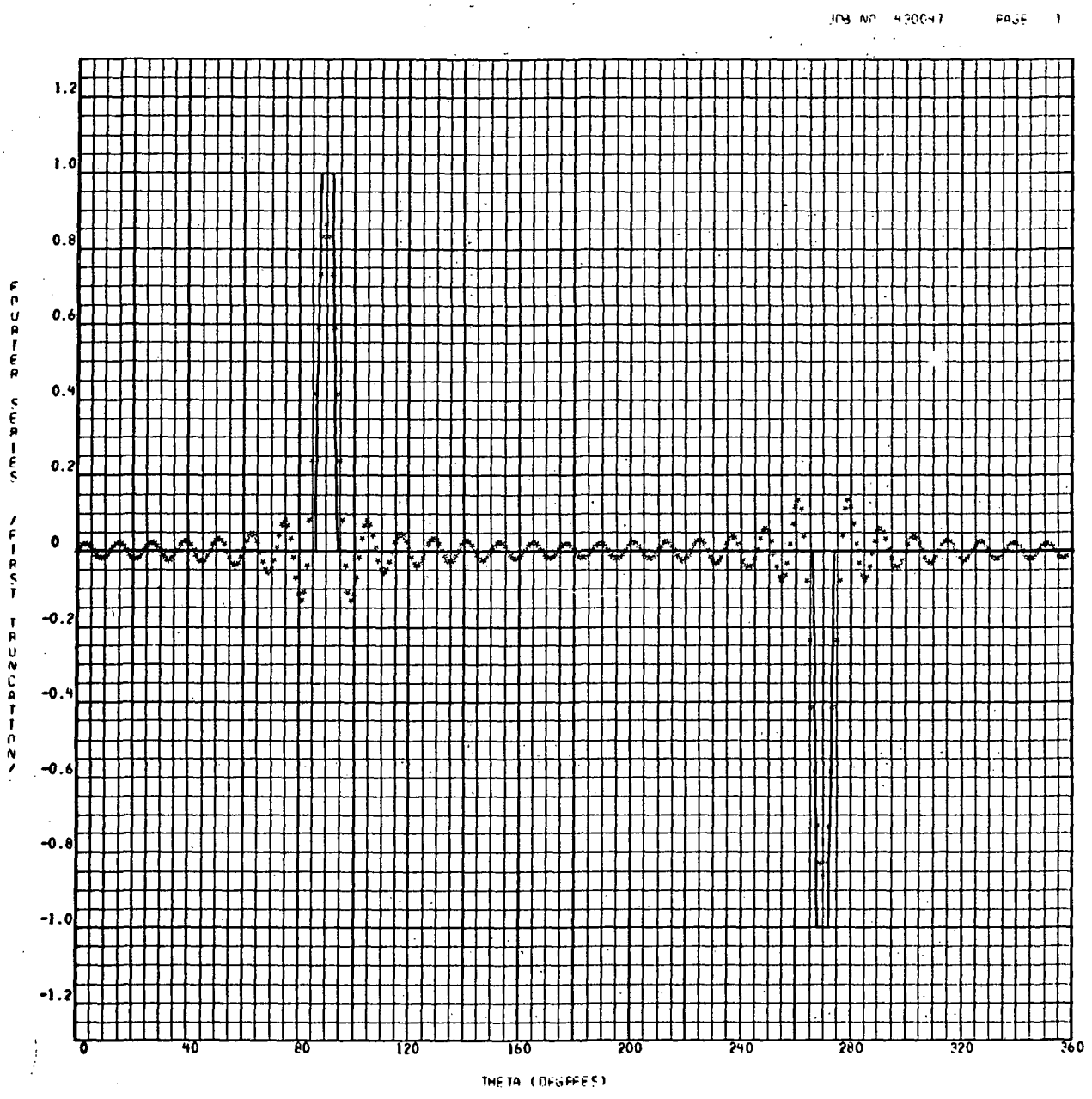
462	4.0317106+00	0.0000000	-3.2412649-02	-9.2403388-04	-7.5708424-03
463	4.0404372+00	0.0000000	-3.1265477-02	-7.8807587-04	-5.2673070-03
464	4.0491639+00	0.0000000	-2.7927047-02	-4.2556152-04	2.1165244-04
465	4.0578905+00	0.0000000	-2.2577505-02	7.6820653-05	5.6906126-03
466	4.0666172+00	0.0000000	-1.5538843-02	5.8850044-04	7.9212296-03
467	4.0753438+00	0.0000000	-7.2562623-03	9.6835572-04	5.5040728-03
468	4.0840704+00	0.0000000	1.7292375-03	1.1029792-03	-2.3886000-04
469	4.0927971+00	0.0000000	1.0815373-02	9.3967890-04	-5.9817935-03
470	4.1015237+00	0.0000000	1.9378063-02	5.0482654-04	-8.3166223-03
471	4.1102504+00	0.0000000	2.6813342-02	-9.8397958-05	-5.7706606-03
472	4.1189770+00	0.0000000	3.2578951-02	-7.1354970-04	2.7106816-04
473	4.1277037+00	0.0000000	3.6232812-02	-1.1706454-03	6.3127977-03
474	4.1364303+00	0.0000000	3.7465722-02	-1.3322121-03	8.7652814-03
475	4.1451570+00	0.0000000	3.6125938-02	-1.1334266-03	6.0723787-03
476	4.1538836+00	0.0000000	3.2233801-02	-6.0493135-04	-3.0962032-04
477	4.1626103+00	0.0000000	2.5985145-02	1.2910231-04	-6.6916202-03
478	4.1713369+00	0.0000000	1.7742982-02	8.7881598-04	-9.2776825-03
479	4.1800636+00	0.0000000	8.0176851-03	1.4365496-03	-6.4159114-03
480	4.1887902+00	0.0000000	-2.5633160-03	1.6330186-03	3.5634425-04
481	4.1975168+00	0.0000000	-1.3294612-02	1.3869398-03	7.1286008-03
482	4.2062435+00	0.0000000	-2.3438303-02	7.3400015-04	9.8673131-03
483	4.2149701+00	0.0000000	-3.2273060-02	-1.7429525-04	6.8097938-03
484	4.2236968+00	0.0000000	-3.9143607-02	-1.1038154-03	-4.1378003-04
485	4.2324234+00	0.0000000	-4.3507340-02	-1.7963260-03	-7.6373548-03
486	4.2411501+00	0.0000000	-4.4974906-02	-2.0392013-03	-1.0551843-02
487	4.2498767+00	0.0000000	-4.3341856-02	-1.7280387-03	-7.2650976-03
488	4.2586034+00	0.0000000	-3.8608985-02	-9.0441023-04	4.8554471-04
489	4.2673300+00	0.0000000	-3.0989650-02	2.4362457-04	8.2361881-03
490	4.2760567+00	0.0000000	-2.0903135-02	1.4214346-03	1.1354890-02
491	4.2847833+00	0.0000000	-8.9540282-03	2.3005625-03	7.7964481-03
492	4.2935100+00	0.0000000	4.1015209-03	2.6070977-03	-5.7693727-04
493	4.3022366+00	0.0000000	1.7400913-02	2.2027433-03	-8.9503238-03
494	4.3109632+00	0.0000000	3.0029038-02	1.1356560-03	-1.2308778-02
495	4.3196899+00	0.0000000	4.1077830-02	-3.5563474-04	-8.4235697-03
496	4.3284165+00	0.0000000	4.9707771-02	-1.8906171-03	6.9598517-04
497	4.3371432+00	0.0000000	5.5207405-02	-3.0391163-03	9.8155412-03
498	4.3458698+00	0.0000000	5.7046917-02	-3.4363953-03	1.3458990-02
499	4.3545965+00	0.0000000	5.4922068-02	-2.8916607-03	9.1737133-03
500	4.3633231+00	0.0000000	4.8785246-02	-1.4595144-03	-8.5534772-04
501	4.3720498+00	0.0000000	3.8861114-02	5.4907300-04	-1.0884410-02
502	4.3807764+00	0.0000000	2.5645160-02	2.6256491-03	-1.4871720-02
503	4.3895031+00	0.0000000	9.8845341-03	4.1844149-03	-1.0085600-02
504	4.3982297+00	0.0000000	-7.4584223-03	4.7174518-03	1.0759936-03
505	4.4069564+00	0.0000000	-2.5258416-02	3.9464895-03	1.2237589-02
506	4.4156830+00	0.0000000	-4.2292653-02	1.9292424-03	1.6647355-02
507	4.4244097+00	0.0000000	-5.7316023-02	-9.1425198-04	1.1216082-02
508	4.4331363+00	0.0000000	-6.9141816-02	-3.8724003-03	-1.3948565-03
509	4.4418629+00	0.0000000	-7.6723261-02	-6.1029907-03	-1.4005796-02
510	4.4505896+00	0.0000000	-7.9230945-02	-8.8522725-03	-1.8946218-02
511	4.4593162+00	0.0000000	-7.6121228-02	-5.6804229-03	-1.2651840-02
512	4.4680429+00	0.0000000	-6.7191134-02	-2.6330120-03	1.8823523-03
513	4.4767695+00	0.0000000	-5.2615804-02	1.6950852-03	1.6416547-02
514	4.4854962+00	0.0000000	-3.2965488-02	6.2423308-03	2.2042083-02
515	4.4942228+00	0.0000000	-9.2001847-03	9.6930923-03	1.4530603-02
516	4.5029495+00	0.0000000	1.7358815-02	1.0817511-02	-2.6877548-03
517	4.5116761+00	0.0000000	4.5079815-02	8.8243131-03	-1.9906115-02

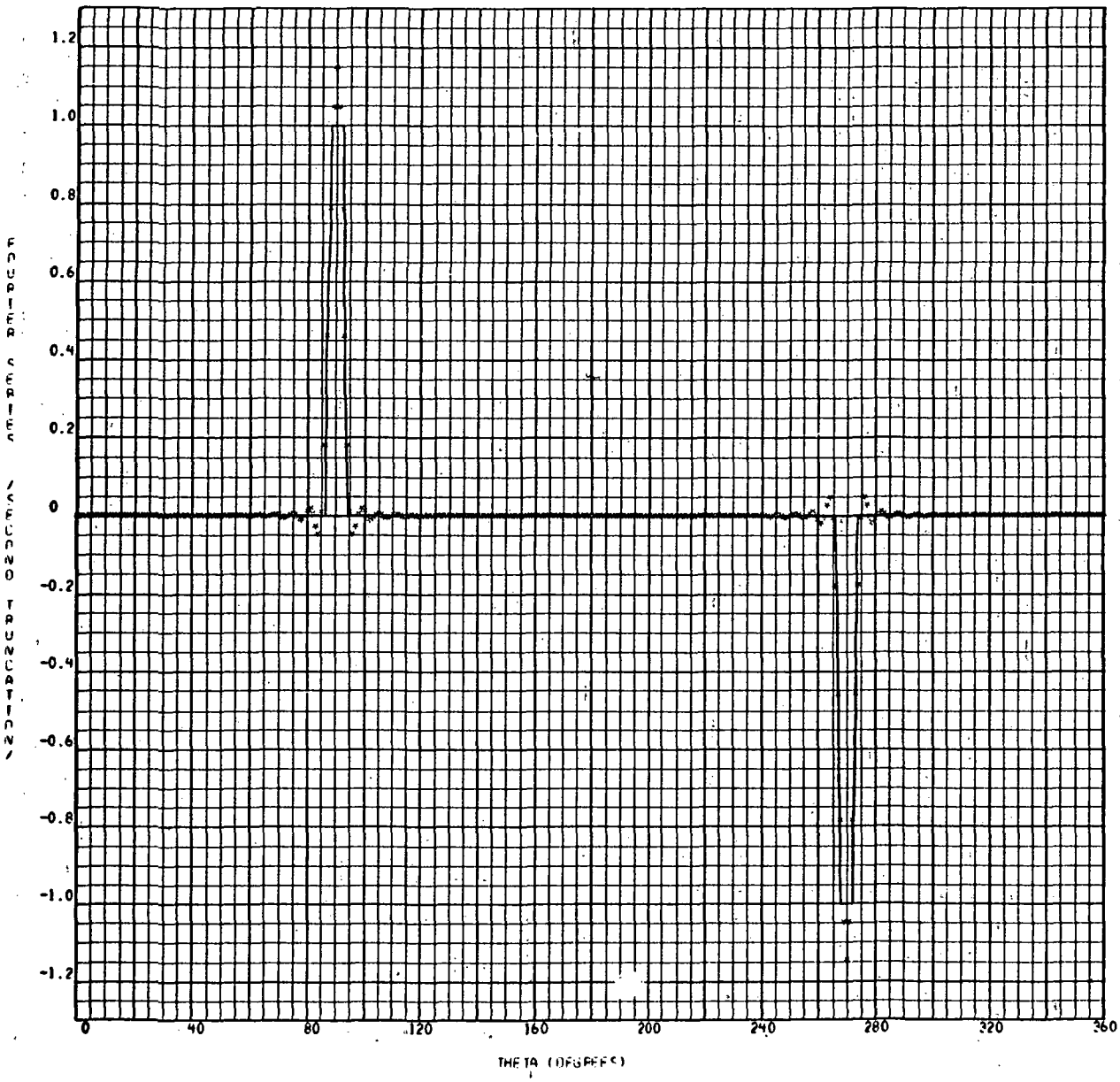
518	4.5204028+00	0.0000000	7.2092119-02	3.6810592-03	-2.6446286-02
519	4.5291294+00	0.0000000	9.6374774-02	-3.7235422-03	-1.7078765-02
520	4.5378561+00	0.0000000	1.1585836-01	-1.1628806-02	4.1786103-03
521	4.5465827+00	0.0000000	1.2853471-01	-1.7698739-02	2.5435988-02
522	4.5553093+00	0.0000000	1.3256876-01	-1.9541985-02	3.3241528-02
523	4.5640360+00	0.0000000	1.2640645-01	-1.5375396-02	2.0654375-02
524	4.5727626+00	0.0000000	1.0887281-01	-4.7054640-03	-7.4924672-03
525	4.5814893+00	0.0000000	7.9254283-02	1.1122622-02	-3.5639314-02
526	4.5902159+00	0.0000000	3.7360691-02	2.8653477-02	-4.5181129-02
527	4.5989426+00	0.0000000	-1.6437412-02	4.2435844-02	-2.5407436-02
528	4.6076692+00	0.0000000	-8.1198537-02	4.5566720-02	1.7899144-02
529	4.6163959+00	0.0000000	-1.5542860-01	3.0628202-02	6.1205730-02
530	4.6251225+00	0.0000000	-2.3712759-01	-9.1026943-03	7.0972819-02
531	4.6338492+00	0.0000000	-3.2386292-01	-7.8358549-02	1.7542709-02
532	4.6425758+00	0.0000000	-4.1286618-01	-1.7872525-01	-1.1107531-01
533	4.6513025+00	-2.5000000-01	-5.0114995-01	-3.0784737-01	-3.0219334-01
534	4.6600291+00	-5.0000000-01	-5.8563212-01	-4.5917294-01	-5.2193777-01
535	4.6687557+00	-7.5000000-01	-6.6328223-01	-6.2233373-01	-7.2801609-01
536	4.6774824+00	-1.0000000+00	-7.3124829-01	-7.8415243-01	-8.8598629-01
537	4.6862090+00	-1.0000000+00	-7.8699203-01	-9.3015850-01	-9.8145650-01
538	4.6949357+00	-1.0000000+00	-8.2840498-01	-1.0464005+00	-1.0225655+00
539	4.7036623+00	-1.0000000+00	-8.5390648-01	-1.1212824+00	-1.0318516+00
540	4.7123890+00	-1.0000000+00	-8.6251750-01	-1.1471364+00	-1.0318516+00
541	4.7211156+00	-1.0000000+00	-8.5390649-01	-1.1212824+00	-1.0318516+00
542	4.7298423+00	-1.0000000+00	-8.2840499-01	-1.0464006+00	-1.0225655+00
543	4.7385689+00	-1.0000000+00	-7.8699204-01	-9.3015856-01	-9.8145653-01
544	4.7472956+00	-1.0000000+00	-7.3124831-01	-7.8415249-01	-8.8598635-01
545	4.7560222+00	-7.5000000-01	-6.6328226-01	-6.2233380-01	-7.2801618-01
546	4.7647489+00	-5.0000000-01	-5.8563216-01	-4.5917301-01	-5.2193787-01
547	4.7734755+00	-2.5000000-01	-5.0114900-01	-3.0784743-01	-3.0219343-01
548	4.7822021+00	0.0000000	-4.1286622-01	-1.7872530-01	-1.1107539-01
549	4.7909288+00	0.0000000	-3.2386295-01	-7.8358588-02	1.7542667-02
550	4.7996554+00	0.0000000	-2.3712763-01	-9.1027188-03	7.0972810-02
551	4.8083821+00	0.0000000	-1.5542863-01	3.0628191-02	6.1205744-02
552	4.8171087+00	0.0000000	-8.1198568-02	4.5566719-02	1.7899165-02
553	4.8258354+00	0.0000000	-1.6437439-02	4.2435848-02	-2.5407420-02
554	4.8345620+00	0.0000000	3.7360669-02	2.8653484-02	-4.5181126-02
555	4.8432887+00	0.0000000	7.9254266-02	1.1122630-02	-3.5639323-02
556	4.8520153+00	0.0000000	1.0887279-01	-4.7054578-03	-7.4924816-03
557	4.8607420+00	0.0000000	1.2640644-01	-1.5375393-02	2.0654364-02
558	4.8694686+00	0.0000000	1.3256875-01	-1.9541985-02	3.3241526-02
559	4.8781953+00	0.0000000	1.2853472-01	-1.7698741-02	2.5435995-02
560	4.8869219+00	0.0000000	1.1585837-01	-1.1628809-02	4.1786211-03
561	4.8956485+00	0.0000000	9.6374784-02	-3.7235458-03	-1.7078756-02
562	4.9043752+00	0.0000000	7.2092131-02	3.6810563-03	-2.6446285-02
563	4.9131018+00	0.0000000	4.5079827-02	8.8243114-03	-1.9906121-02
564	4.9218285+00	0.0000000	1.7358828-02	1.0817511-02	-2.6877636-03
565	4.9305551+00	0.0000000	-9.2001727-03	9.6938934-03	1.4530597-02
566	4.9392818+00	0.0000000	-3.2965478-02	6.2423326-03	2.2042082-02
567	4.9480084+00	0.0000000	-5.2615795-02	1.6958873-03	1.6416552-02
568	4.9567351+00	0.0000000	-6.7191128-02	-2.6330103-03	1.8823598-03
569	4.9654617+00	0.0000000	-7.6121223-02	-5.6804219-03	-1.2651835-02
570	4.9741884+00	0.0000000	-7.9230943-02	-6.8522724-03	-1.8946217-02
571	4.9829150+00	0.0000000	-7.6723263-02	-6.1029913-03	-1.4005800-02
572	4.9916417+00	0.0000000	-6.9141820-02	-3.8724015-03	-1.3948630-03
573	5.0003683+00	0.0000000	-5.7316029-02	-9.1425334-04	1.1216076-02

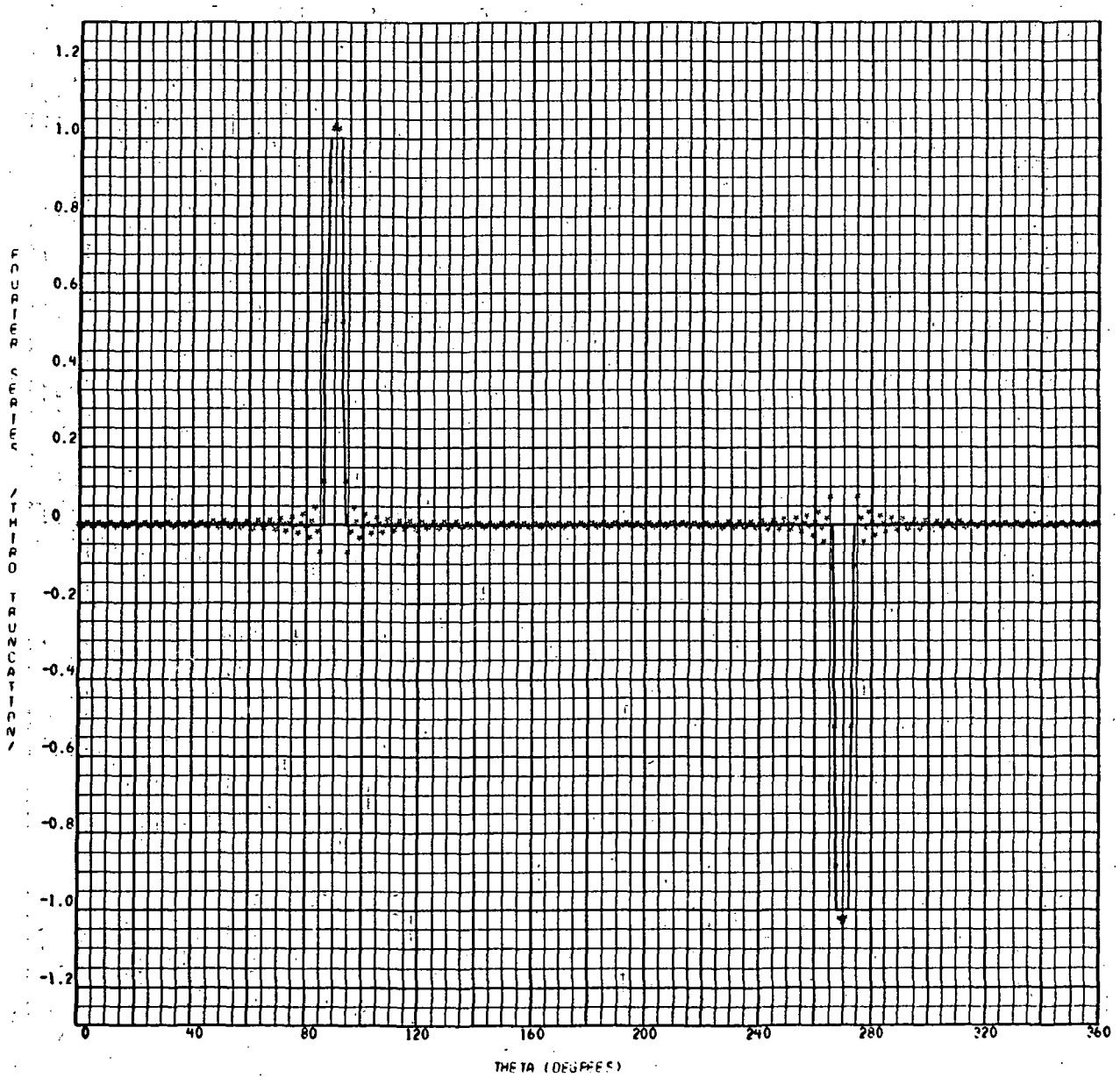
574	5.0090950+00	0.0000000	-4.2292660-02	1.9292413-03	1.6647354-02
575	5.0178216+00	0.0000000	-2.5258424-02	3.9464889-03	1.2237592-02
576	5.0265482+00	0.0000000	-7.4584306-03	4.7174518-03	1.0759994-03
577	5.0352749+00	0.0000000	9.8845260-03	4.1844153-03	-1.0085595-02
578	5.0440015+00	0.0000000	2.5645152-02	2.6256499-03	-1.4871719-02
579	5.0527282+00	0.0000000	3.8861107-02	5.4907393-04	-1.0884413-02
580	5.0614548+00	0.0000000	4.8785241-02	-1.4595136-03	-8.5535294-04
581	5.0701815+00	0.0000000	5.4922064-02	-2.8916602-03	9.1737090-03
582	5.0789081+00	0.0000000	5.7046916-02	-3.4363953-03	1.3458989-02
583	5.0876348+00	0.0000000	5.5207406-02	-3.0391167-03	9.8155440-03
584	5.0963614+00	0.0000000	4.9707773-02	-1.8906177-03	6.9598994-04
585	5.1050881+00	0.0000000	4.1077834-02	-3.5563543-04	-8.4235657-03
586	5.1138147+00	0.0000000	3.0029043-02	1.1356554-03	-1.2308777-02
587	5.1225414+00	0.0000000	1.7400919-02	2.2027430-03	-8.9503264-03
588	5.1312680+00	0.0000000	4.1015272-03	2.6070977-03	-5.7694168-04
589	5.1399946+00	0.0000000	-8.9540218-03	2.3005628-03	7.7964444-03
590	5.1487213+00	0.0000000	-2.0903129-02	1.4214351-03	1.1354889-02
591	5.1574479+00	0.0000000	-3.0989645-02	2.4362509-04	8.2361904-03
592	5.1661746+00	0.0000000	-3.8608980-02	-9.0440978-04	4.8554882-04
593	5.1749012+00	0.0000000	-4.3341853-02	-1.7280384-03	-7.2650941-03
594	5.1836279+00	0.0000000	-4.4974905-02	-2.0392013-03	-1.0551842-02
595	5.1923545+00	0.0000000	-4.3507340-02	-1.7963263-03	-7.6373569-03
596	5.2010812+00	0.0000000	-3.9143608-02	-1.1038158-03	-4.1378389-04
597	5.2098078+00	0.0000000	-3.2273063-02	-1.7429566-04	6.8097904-03
598	5.2185345+00	0.0000000	-2.3438307-02	7.3399980-04	9.8673123-03
599	5.2272611+00	0.0000000	-1.3294617-02	1.3869396-03	7.1286028-03
600	5.2359878+00	0.0000000	-2.5633212-03	1.6330186-03	3.5634790-04
601	5.2447144+00	0.0000000	8.0176798-03	1.4365497-03	-6.4159082-03
602	5.2534410+00	0.0000000	1.7742977-02	8.7881627-04	-9.2776816-03
603	5.2621677+00	0.0000000	2.5985141-02	1.2910263-04	-6.6916220-03
604	5.2708943+00	0.0000000	3.2233798-02	-6.0493108-04	-3.0962379-04
605	5.2796210+00	0.0000000	3.6125936-02	-1.1334264-03	6.0723756-03
606	5.2883476+00	0.0000000	3.7465721-02	-1.3322121-03	8.7652806-03
607	5.2970743+00	0.0000000	3.6232812-02	-1.1706456-03	6.3127995-03
608	5.3058009+00	0.0000000	3.2578952-02	-7.1354993-04	2.7107147-04
609	5.3145276+00	0.0000000	2.6813344-02	-9.8398217-05	-5.7706576-03
610	5.3232542+00	0.0000000	1.9378066-02	5.0482632-04	-8.3166215-03
611	5.3319809+00	0.0000000	1.0815377-02	9.3967877-04	-5.9817951-03
612	5.3407075+00	0.0000000	1.7292421-03	1.1029792-03	-2.3886317-04
613	5.3494342+00	0.0000000	-7.2562576-03	9.6835583-04	5.5040699-03
614	5.3581608+00	0.0000000	-1.5538839-02	5.8850062-04	7.9212288-03
615	5.3668874+00	0.0000000	-2.2577501-02	7.6820863-05	5.6906142-03
616	5.3756141+00	0.0000000	-2.7927044-02	-4.2556135-04	2.1165550-04
617	5.3843407+00	0.0000000	-3.1265474-02	-7.8807577-04	-5.2673042-03
618	5.3930674+00	0.0000000	-3.2412648-02	-9.2403388-04	-7.5708415-03
619	5.4017940+00	0.0000000	-3.1339120-02	-8.1067610-04	-5.4329768-03
620	5.4105207+00	0.0000000	-2.8164835-02	-4.9149530-04	-1.8844257-04
621	5.4192473+00	0.0000000	-2.3147945-02	-6.1227065-05	5.0560927-03
622	5.4279740+00	0.0000000	-1.6664710-02	3.6163980-04	7.2588587-03
623	5.4367006+00	0.0000000	-9.1819832-03	6.6701534-04	5.2038828-03
624	5.4454273+00	0.0000000	-1.2242340-03	7.8142506-04	1.6845868-04
625	5.4541539+00	0.0000000	6.6625866-03	6.8517835-04	-4.8669665-03
626	5.4628806+00	0.0000000	1.3947909-02	4.1462230-04	-6.9799430-03
627	5.4716072+00	0.0000000	2.0151676-02	4.9690131-05	-4.9993018-03
628	5.4803338+00	0.0000000	2.4875459-02	-3.0924107-04	-1.5111232-04
629	5.4890605+00	0.0000000	2.7827567-02	-5.6860327-04	4.6970781-03

630	5.4977871+00	0.0000000	2.8840597-02	-6.6569605-04	6.7297338-03
631	5.5065138+00	0.0000000	2.7880408-02	-5.8345433-04	4.8159502-03
632	5.5152404+00	0.0000000	2.5046055-02	-3.5255839-04	1.3594046-04
633	5.5239671+00	0.0000000	2.0560863-02	-4.0984195-05	-4.5440703-03
634	5.5326937+00	0.0000000	1.4755367-02	2.6564431-04	-6.5046352-03
635	5.5414204+00	0.0000000	8.0433935-03	4.8731441-04	-4.6511273-03
636	5.5501470+00	0.0000000	8.9298275-04	5.7024885-04	-1.2257626-04
637	5.5588737+00	0.0000000	-6.2058383-03	4.9964742-04	4.4059757-03
638	5.5676003+00	0.0000000	-1.2774238-02	3.0161429-04	6.3016577-03
639	5.5763270+00	0.0000000	-1.8376498-02	3.4304042-05	4.5025925-03
640	5.5850536+00	0.0000000	-2.2648564-02	-2.2886932-04	1.1072585-04
641	5.5937802+00	0.0000000	-2.5321380-02	-4.1918506-04	-4.2811417-03
642	5.6025069+00	0.0000000	-2.6237535-02	-4.9036275-04	-6.1182971-03
643	5.6112335+00	0.0000000	-2.5360201-02	-4.2957367-04	-4.3684731-03
644	5.6199602+00	0.0000000	-2.2773884-02	-2.5916643-04	-1.0015143-04
645	5.6286868+00	0.0000000	-1.8677060-02	-2.9106057-05	4.1681711-03
646	5.6374135+00	0.0000000	-1.3367275-02	1.9744618-04	5.9524426-03
647	5.6461401+00	0.0000000	-7.2198313-03	3.6130876-04	4.2471931-03
648	5.6548668+00	0.0000000	-6.6154535-04	4.2258427-04	9.0658774-05
649	5.6635934+00	0.0000000	5.8585944-03	3.7017642-04	-4.0658765-03
650	5.6723201+00	0.0000000	1.1899882-02	2.2330623-04	-5.8023043-03
651	5.6810467+00	0.0000000	1.7059406-02	2.5014420-05	-4.1374185-03
652	5.6897734+00	0.0000000	2.0998672-02	-1.7026380-04	-8.2087806-05
653	5.6985000+00	0.0000000	2.3465577-02	-3.1151178-04	3.9732438-03
654	5.7072267+00	0.0000000	2.4310337-02	-3.6433588-04	5.6663571-03
655	5.7159533+00	0.0000000	2.3494369-02	-3.1917714-04	4.0380138-03
656	5.7246799+00	0.0000000	2.1091612-02	-1.9261670-04	7.4305520-05
657	5.7334066+00	0.0000000	1.7282293-02	-2.1763917-05	-3.8894037-03
658	5.7421332+00	0.0000000	1.2339624-02	1.4646790-04	-5.5432958-03
659	5.7508599+00	0.0000000	6.6104096-03	2.6813852-04	-3.9480088-03
660	5.7595865+00	0.0000000	4.9092150-04	3.1365805-04	-6.7200503-05
661	5.7683132+00	0.0000000	-5.6002961-03	2.7484573-04	3.8136087-03
662	5.7770398+00	0.0000000	-1.1250839-02	1.6602602-04	5.4319996-03
663	5.7857665+00	0.0000000	-1.6082156-02	1.9164044-05	3.8665707-03
664	5.7944931+00	0.0000000	-1.9774723-02	-1.2539084-04	6.0678714-05
665	5.8032198+00	0.0000000	-2.2088999-02	-2.2990620-04	-3.7452142-03
666	5.8119464+00	0.0000000	-2.2880818-02	-2.6903520-04	-5.3315032-03
667	5.8206731+00	0.0000000	-2.2110233-02	-2.3584555-04	-3.7929829-03
668	5.8293997+00	0.0000000	-1.9843265-02	-1.4270932-04	-5.4660173-05
669	5.8381263+00	0.0000000	-1.6246524-02	-1.7075892-05	3.6836635-03
670	5.8468530+00	0.0000000	-1.1575108-02	1.0650242-04	5.2409736-03
671	5.8555796+00	0.0000000	-6.1546541-03	1.9580435-04	3.7266273-03
672	5.8643063+00	0.0000000	-3.5879841-04	2.2927539-04	4.9076348-05
673	5.8730329+00	0.0000000	5.4164141-03	2.0112662-04	-3.6284755-03
674	5.8817596+00	0.0000000	1.0779423-02	1.2202113-04	-5.1596913-03
675	5.8904862+00	0.0000000	1.5369534-02	1.5396927-05	-3.6669700-03
676	5.8992129+00	0.0000000	1.8881031-02	-8.9374680-05	-4.3868069-05
677	5.9079395+00	0.0000000	2.1083398-02	-1.6502367-04	3.5792347-03
678	5.9166662+00	0.0000000	2.1836346-02	-1.9342556-04	5.0870346-03
679	5.9253928+00	0.0000000	2.1098651-02	-1.6985037-04	3.6135495-03
680	5.9341195+00	0.0000000	1.8930266-02	-1.0344805-04	3.8983854-05
681	5.9428461+00	0.0000000	1.5487600-02	-1.4050770-05	-3.5355827-03
682	5.9515727+00	0.0000000	1.1012337-02	7.3656248-05	-5.0224670-03
683	5.9602994+00	0.0000000	5.8145777-03	1.3690489-04	-3.5659674-03
684	5.9690260+00	0.0000000	2.5147535-04	1.6071060-04	-3.4378551-05
685	5.9777527+00	0.0000000	-5.2971676-03	1.4133565-04	3.4972112-03

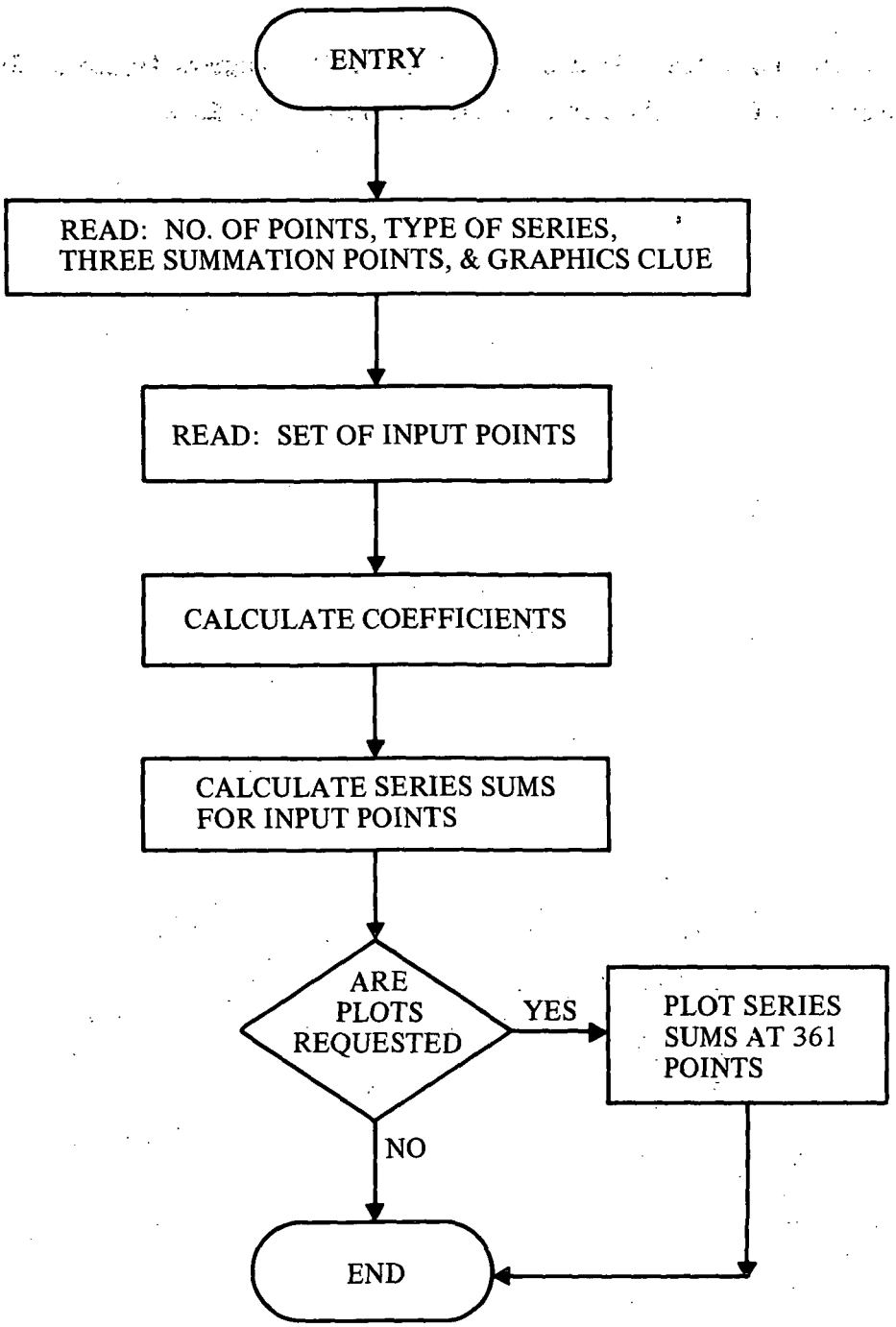
686	5.9864793+00	0.0000000	-1.0454691-02	8.6574931-05	4.9655268-03
687	5.9952060+00	0.0000000	-1.4873006-02	1.2980220-05	3.5238803-03
688	6.0039326+00	0.0000000	-1.8255967-02	-5.9053286-05	3.0012223-05
689	6.0126593+00	0.0000000	-2.0379107-02	-1.1090109-04	-3.4638568-03
690	6.0213859+00	0.0000000	-2.1104446-02	-1.3048863-04	-4.9158184-03
691	6.0301126+00	0.0000000	-2.0389392-02	-1.1501920-04	-3.4869934-03
692	6.0388392+00	0.0000000	-1.8289163-02	-7.1060153-05	-2.5849227-05
693	6.0475659+00	0.0000000	-1.4952607-02	-1.2142434-05	3.4352959-03
694	6.0562925+00	0.0000000	-1.0611719-02	4.5315056-05	4.8730051-03
695	6.0650191+00	0.0000000	-5.5655971-03	8.6549564-05	3.4550552-03
696	6.0737458+00	0.0000000	-1.5993760-04	1.0221758-04	2.1857448-05
697	6.0824724+00	0.0000000	5.2365296-03	9.0426051-05	-3.4113412-03
698	6.0911991+00	0.0000000	1.0257072-02	5.6617306-05	-4.8368036-03
699	6.0999257+00	0.0000000	1.4561758-02	1.1505563-05	-3.4278528-03
700	6.1086524+00	0.0000000	1.7860359-02	-3.2222700-05	-1.8007646-05
701	6.1173790+00	0.0000000	1.9931826-02	-6.3450086-05	3.3918385-03
702	6.1261057+00	0.0000000	2.0639025-02	-7.5429571-05	4.8069786-03
703	6.1348323+00	0.0000000	1.9937770-02	-6.7146984-05	3.4052089-03
704	6.1435590+00	0.0000000	1.7879542-02	-4.3001236-05	1.4272903-05
705	6.1522856+00	0.0000000	1.4607756-02	-1.1046402-05	-3.3766641-03
706	6.1610123+00	0.0000000	1.0347809-02	1.9580276-05	-4.7833397-03
707	6.1697389+00	0.0000000	5.3916339-03	4.1247879-05	-3.3869782-03
708	6.1784655+00	0.0000000	7.7779712-05	4.9710762-05	-1.0628136-05
709	6.1871922+00	0.0000000	-5.2316053-03	4.4820771-05	3.3657229-03
710	6.1959188+00	0.0000000	-1.0175344-02	2.9997191-05	4.7657380-03
711	6.2046455+00	0.0000000	-1.4417690-02	1.0748772-05	3.3730454-03
712	6.2133721+00	0.0000000	-1.7671024-02	-7.2073499-06	7.0496703-06
713	6.2220988+00	0.0000000	-1.9715269-02	-1.9619680-05	-3.3589470-03
714	6.2308254+00	0.0000000	-2.0412706-02	-2.4685006-05	-4.7540637-03
715	6.2395521+00	0.0000000	-1.9717214-02	-2.3119821-05	-3.3633235-03
716	6.2482787+00	0.0000000	-1.7677303-02	-1.7412118-05	-3.5148526-06
717	6.2570054+00	0.0000000	-1.4432743-02	-1.0602434-05	3.3562947-03
718	6.2657320+00	0.0000000	-1.0205036-02	-5.0674197-06	4.7482444-03
719	6.2744587+00	0.0000000	-5.2823576-03	-1.7380801-06	3.3577522-03
720	6.2831853+00	0.0000000	-2.4297449-09	-6.5353641-13	1.6959925-09


JOB NO 420047 PAGE 1
FOURIER SERIES (FIRST TRUNCATION)
1.2
1.0
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
0
40
80
120
160
200
240
280
320
360
THETA (DEGREES)


1.2
1.0
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
FOURIER SERIES (SECOND TRUNCATION)
0
40
80
120
160
200
240
280
320
360
THETA (DEGREES)


FOURIER SERIES (THIRD TRUNCATION)
1.2
1.0
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
0
40
80
120
160
200
240
280
320
360
THETA (DEGREES)

The flow chart and listing for the SAT-2S program follow. There is only one routine, MAIN, aside from system graphics routines.


ENTRY
READ: NO. OF POINTS, TYPE OF SERIES, THREE SUMMATION POINTS, & GRAPHICS CLUE
READ: SET OF INPUT POINTS
CALCULATE COEFFICIENTS
CALCULATE SERIES SUMS FOR INPUT POINTS
ARE PLOTS REQUESTED
YES
PLOT SERIES SUMS AT 361 POINTS
NO
END

```
RUN,//T STARSS,430047,KEYJØHBIN214,1,500
FØR,IS MAIN,MAIN
C
C     ****************************************************************
C     *                                                              *
C     *                          SATELLITE-2S                        *
C     *                                                              *
C     *     CØNVERSIØN ØF DISCRETE PØINTS TØ FØURIER SERIES INPUT    *
C     *                            FØR                               *
C     *                       STARS-2S (STATICS)                     *
C     *                                                              *
C     ****************************************************************
C
      DØUBLE PRECISIØN   U,A,B,THETA,ALPHA,ZERØ,TWØ,PI,CTERM,Z,XN2,UNJ
      DØUBLE PRECISIØN SUM
      SIN(X) = DSIN(X)
      CØS(X) = DCØS(X)
      DIMENSIØN Y(720),U(720),A(201),B(201),THETA(721),ALPHA(721)
      DIMENSIØN NUM(3),HUM(721,3),Y1(721),Y2(721),Y3(721)
      DIMENSIØN FLDX(12),FLDY(12)
      DIMENSIØN FLDY1(12),FLDY2(12),FLDY3(12)
      DIMENSIØN IDARY(2)
      DIMENSIØN ALPHN(720),YG(720),ALFA(721)
      EQUIVALENCE (U(1),HUM(1,1))
      EQUIVALENCE (HUM(1,1),Y1(1)),(HUM(1,2),Y2(1)),(HUM(1,3),Y3(1))
      DATA IDARY/-HARDCØ-,-PY    -/                                    C
      DATA FLDX/-THETA -,-(DEGRE-,-ES)   -,9*6H      /                 C
      DATA FLDY1/-FØURIE-,-R SERI-,-ES  /F-,-IRST T-,-RUNCAT-,-IØN/  -, C
     1          6*6H      /                                           C
      DATA FLDY2/-FØURIE-,-R SERI-,-ES  /S-,-ECØND -,-TRUNCA-,-TIØN/ -, C
     1          6*6H      /                                           C
      DATA FLDY3/-FØURIE-,-R SERI-,-ES  /T-,-HIRD T-,-RUNCAT-,-IØN/  -, C
     1          6*6H      /                                           C
      ZERØ = 0.DO
      TWØ = 2.DO
      JFLAG = 0
      NCLU = 3                                                        SAT00050
    1 READ(5,10,END=500) N,NTRIG,NUM(1),NUM(2),NHARM,MFLAG,INC
   10 FØRMAT(7I3)
      INCR=IABS(INC)
      IF (INCR.EQ.0) INCR = 1
      READ(5,20)(Y(I),I=1,N)                                          SAT00070
   20 FØRMAT(5E14.7)                                                  SAT00040
      NUM(3) = NHARM                                                  SAT00080
      IF(N.GE.20)GØ TØ 3                                              SAT00090
      WRITE(6,4)                                                      SAT00100
    4 FØRMAT(-0AT LEAST 20 INPUT PTS. ARE NEEDED. CASE STØPPED.-)     SAT00110
      GØ TØ 1                                                         SAT00120
    3 PI = 3.1415926536
      CTERM = ZERØ
      Z = TWØ*PI/N
      XN2 = TWØ/N
      KLUT = 1
      NØLD = N
      N1=N-1                                                          SAT00170
      WRITE(6,901) N                                                  SAT00180
  901 FØRMAT(1H1,20(/),60X,-SATELLITE-2S-////28X,76HCØNVERSIØN ØF DISCRE
     1TE PØINTS TØ FØURIER SERIES INPUT FØR STARS-2S (STATICS)////52X,
     2       27HVERSIØN DATE   JULY 1, 1972,18(/),5X,
     3       14HNØ. ØF PTS. = ,I3/)                                   SAT00220
      MTRIG = NTRIG+1                                                 SAT00230
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      GØ TØ (600,700,800),MTRIG                                          SAT00240
  500 WRITE(6,601)                                                       SAT00250
  601 FØRMAT(5X,11HFULL SERIES/)                                         SAT00260
      GØ TØ 1000                                                         SAT00270
  700 WRITE(6,701)                                                       SAT00280
  701 FØRMAT(5X,18HCØSINE HALF-SERIES/)                                  SAT00290
      GØ TØ 1000                                                         SAT00300
  800 WRITE(6,801)                                                       SAT00310
  801 FØRMAT(5X,16HSINE HALF-SERIES/)                                    SAT00320
 1000 WRITE(6,1001) NHARM,NUM                                            SAT00330
 1001 FØRMAT(5X,25HTØTAL NØ. ØF HARMØNICS = ,I3//5X,                     SAT00340
     1       7HSUMS AT,I4,2(1H,,I4)/80X,35HFØR INFØRMATIØN CALL    V. SVA
     2LBØNAS/117X,14H(516) 575-7701/103X,10HP. ØGILVIE)
      YSUM=0.
      DØ 30 I=1,N                                                        SAT00360
      YSUM=YSUM+Y(I)
   30 THETA(I)=Z*I                                                       SAT00370
      YSUM=YSUM+Y(N)
      NHAR=NHARM+1                                                       SAT00380
      DØ 100 J=1,NHAR                                                    SAT00390
      A(J) = ZERØ
      B(J) = ZERØ
      U(N) = ZERØ
      UNJ = ZERØ
      JJ=J                                                               SAT00440
      IF(J.EQ.NHAR)JJ=0                                                  SAT00450
      IF(JJ.EQ.0.AND.NTRIG.EQ.2)GØ TØ 100                                SAT00460
      K=N                                                                SAT00470
      DØ 50 I=1,N1                                                       SAT00480
      K=K-1                                                              SAT00490
      U(K) = Y(K)+TWØ*CØS(THETA(J))*U(K+1)-UNJ
   50 UNJ = U(K+1)
      IF(NTRIG.EQ.2)GØ TØ 60                                             SAT00520
      IF(JJ.EQ.0)GØ TØ 70                                                SAT00530
      A(J) = XN2*(Y(1)+U(1)*CØS(THETA(J))-U(2))
      IF(NTRIG.EQ.1) GØ TØ 100                                           SAT00550
   60 B(J) = XN2*U(1)*SIN(THETA(J))
      GØ TØ 100                                                          SAT00570
   70 CTERM=YSUM/N
  100 CØNTINUE                                                           SAT00590
      WRITE(6,37)                                                        SAT00600
   37 FØRMAT(1H1,29X,-HARMØNIC NØ.-,3X,-CØSINE CØEFFICIENT-,5X,
     1       -SINE CØEFFICIENT-/)
      I = 0
      Z = ZERØ
      IF (NTRIG.EQ.2) CTERM = ZERØ
      WRITE(6,39) I,CTERM,Z
   39 FØRMAT(34X,I3,10X,E14.7,8X,E14.7)                                  SAT00650
      DØ 38 I=1,NHARM                                                    SAT00630
   38 WRITE(6,39) I,A(I),B(I)                                            SAT00640
      IF (INCR.GT.1) GØ TØ 260
      WRITE(6,112)
  112 FØRMAT(//77X,22HS E R I E S    S U M S)
      GØ TØ 261
  260 WRITE(6,113) INCR
  113 FØRMAT(//68X,37HS E R I E S    S U M S    (MULTIPLE =,I2,1H))
  261 WRITE(6,118) NUM
  118 FØRMAT(/2X,7HPT. NØ.,10X,5HTHETA,10X,15HINPUT AMPLITUDE,7X,
     1   3(I3,10H HARMØNICS,12X)/)
 3000 CØNTINUE
      IF(NTRIG-1)110,150,200                                             SAT00690
```

```
 110 DØ 140 J=1,N                                                        SAT00700
     SUM=CTERM                                                           SAT00710
     NMAR=0                                                              SAT00720
     INDX = 1
     IF(INC.GT.0) INDX=INCR
     ISTØP=NUM(1)                                                        SAT00740
 115 NMAR=NMAR+1                                                         SAT00750
     DØ 120 K=INDX,ISTØP,INCR
     Z=K                                                                 SAT00770
     SUM = SUM+A(K)*CØS(Z*THETA(J))+B(K)*SIN(Z*THETA(J))
 120 CØNTINUE
     HUM(J,NMAR) = SUM
     IF(NMAR.EQ.NCLU)GØ TØ 130                                           SAT00800
     INDX = ISTØP+INCR
     ISTØP=NUM(NMAR+1)                                                   SAT00820
     GØ TØ 115                                                           SAT00830
 130 IF (KLUT.EQ.1) WRITE(6,121) J,THETA(J),Y(J),(HUM(J,I),I=1,3)            C
 121 FØRMAT(I6,6X,1P1E16.7,5X,1P1E16.7,6X,3(1P1E15.7,10X))               SAT00850
 140 CØNTINUE                                                            SAT00860
     GØ TØ 2000
 150 DØ 180 J=1,N                                                        SAT00880
     SUM=CTERM                                                           SAT00890
     NMAR=0                                                              SAT00900
     INDX = 1
     IF(INC.GT.0) INDX=INCR
     ISTØP=NUM(1)                                                        SAT00920
 155 NMAR=NMAR+1                                                         SAT00930
     DØ 160 K=INDX,ISTØP,INCR
     Z=K                                                                 SAT00950
     SUM = SUM+A(K)*CØS(Z*THETA(J))
 160 CØNTINUE
     HUM(J,NMAR) = SUM
     IF(NMAR.EQ.NCLU)GØ TØ 170                                           SAT00980
     INDX = ISTØP+INCR
     ISTØP=NUM(NMAR+1)                                                   SAT01000
     GØ TØ 155                                                           SAT01010
 170 IF (KLUT.EQ.1) WRITE(6,121) J,THETA(J),Y(J),(HUM(J,I),I=1,3)            C
 180 CØNTINUE                                                            SAT01030
     GØ TØ 2000
 200 DØ 250 J=1,N                                                        SAT01050
     SUM = ZERØ
     NMAR=0                                                              SAT01070
     INDX = 1
     IF(INC.GT.0) INDX=INCR
     ISTØP=NUM(1)                                                        SAT01090
 210 NMAR=NMAR+1                                                         SAT01100
     DØ 220 K=INDX,ISTØP,INCR
     Z=K                                                                 SAT01120
     SUM = SUM+B(K)*SIN(Z*THETA(J))
 220 CØNTINUE
     HUM(J,NMAR) = SUM
     IF(NMAR.EQ.NCLU)GØ TØ 240                                           SAT01150
     INDX = ISTØP+INCR
     ISTØP=NUM(NMAR+1)                                                   SAT01170
     GØ TØ 210                                                           SAT01180
 240 IF (KLUT.EQ.1) WRITE(6,121) J,THETA(J),Y(J),(HUM(J,I),I=1,3)            C
 250 CØNTINUE                                                            SAT01200
2000 CØNTINUE
     IF (MFLAG.EQ.0) GØ TØ 1
     GØ TØ (2050,2060),KLUT
2050 YMIN = Y(1)
```

```
      YMAX = Y(1)
      DØ 400 J=1,N
      YM = Y(J)
      IF (YM.LT.YMIN) YMIN = YM
      IF (YM.GT.YMAX) YMAX = YM
  400 CØNTINUE
      YMX = ABS(YMAX)
      AYMIN = ABS(YMIN)
      IF (AYMIN.GT.YMX) YMX = AYMIN
      DELTA = .25*YMX
      YRMX = YMAX+DELTA
      YRMN = YMIN-DELTA
      XMIN = 0.0
      XMAX = 360.0
      CALL SCRND (YRMX,YRMN,YMAX,YMIN)
      DØ 401 J=1,N
      ALPHA(J) = THETA(J)*180.DO/PI
      YG(J) = Y(J)
  401 ALPHN(J) = ALPHA(J)
      IF (JFLAG.EQ.1) GØ TØ 900
      CALL IDENT (9,IDARY)
      JFLAG = 1
  900 CØNTINUE
      KLUT = 2
      N = 361
      Z = TWØ*PI/(N-1)
      DØ 300 I=1,N
      THETA(I) = Z*(I-1)
  300 ALPHA(I) = THETA(I)*180.DO/PI
      GØ TØ 3000
 2060 DØ 450 I=1,N
  450 ALFA(I) = ALPHA(I)
      CALL QUIK3L (-1,XMIN,XMAX,YMIN,YMAX,1H ,FLDX,FLDY1,-NØLD,ALPHN,YG)
      CALL QUIK3L (0,XMIN,XMAX,YMIN,YMAX,1H*,FLDX,FLDY,N,ALFA,Y1)
      CALL QUIK3L (-1,XMIN,XMAX,YMIN,YMAX,1H ,FLDX,FLDY2,-NØLD,ALPHN,YG)
      CALL QUIK3L (0,XMIN,XMAX,YMIN,YMAX,1H*,FLDX,FLDY,N,ALFA,Y2)
      CALL QUIK3L (-1,XMIN,XMAX,YMIN,YMAX,1H ,FLDX,FLDY3,-NØLD,ALPHN,YG)
      CALL QUIK3L (0,XMIN,XMAX,YMIN,YMAX,1H*,FLDX,FLDY,N,ALFA,Y3)
      GØ TØ 1
  500 IF (JFLAG.EQ.1) CALL ENDJØB
      STØP
      END                                                    SAT01230
MAP,IS A,B
LIB SYS$*MSFC$.
IN MAIN
XQT B
```

SECTION 3

SATELLITE-1B PROGRAM

The discussions in SECTION 1 for items 1.1, 1.2 are equally valid for all SAT-1 ( ) programs.

EXAMPLES, FLOW CHART, LISTING: Two sample test problems are executed by the SAT-1B program. Both problems involve explicit input errors. The first problem errors are as follows:

1. The ring specification number on the first region card exceeds 28, the maximum number of rings allowable.

2. The number of points input on the first segment exceeds 14, the maximum number allowable. Since the program does not know if the input number 15 is in error, or if the user actually input an extra point, it scans for the next separator card before restarting. After printing an appropriate message the cards up to the separator are not checked, but printed in card image form.

3. The clue for the second segment should be either 14A or 14B.

4. After finishing region one, the program scans the ring cards assumming the input number, 29, as being correct. It finds that on all 29 rings, the ring centroid radius is input as zero.

5. The second region, second segment has the errors noted in items 3 and 2 above.

6. The structure ring specification number has also exceeded 28, and again when the ring cards are checked a zero ring centroidal radius is found on all rings.

7. The error count is printed as 64.

SATELLITE-1B

STARS-2B (BUCKLING) DATA DEBUGGING PROGRAM

VERSION DATE JULY 1, 1972

FOR INFORMATION CALL V. SVALBONAS
(514) 575-7701
P. OGILVIE

```
   M.S.F.C.      TWO REGIONS EQUAL FOUR SEGMENTS
2  4  1  0  1  1  2  1  1

                                        NOTE - PROGRAM EXPECTS THE PREBUCKLING STRESS STATE TO BE INPUT.

                                        NOTE - BASIC EIGENVALUE CALCULATIONS WILL BE PERFORMED BY DETERMINANT EVALUATION.

STEEL     ORTHOTROPIC
   .0000000      .0000000      .0000000      .0000000      .0000000
   .0000000      .0000000      .0000000      .0000000      .0000000
   .3000000+08   .0000000      .0000000      .0000000      .0000000
   .0000000      .0000000      .0000000      .0000000      .0000000
   .3000000+08   .0000000      .0000000      .0000000      .0000000
   .0000000      .0000000      .0000000      .0000000      .0000000
   .2000000+00   .0000000      .0000000      .0000000      .0000000
   .0000000      .0000000      .0000000      .0000000      .0000000
   .1250000-05   .0000000      .0000000      .0000000      .0000000
   .0000000      .0000000      .0000000      .0000000      .0000000
   .1250000-05   .0000000      .0000000      .0000000      .0000000
   .0000000      .0000000      .0000000      .0000000      .0000000
   .1250000+08   .0000000      .0000000      .0000000      .0000000
   .0000000      .0000000      .0000000      .0000000      .0000000
```

90

```
2 029 1 REGION  > 2 SEGMENTS

   THE NUMBER OF REGION RINGS EXCEEDS 28.

    *   REGION NUMBER  1   *


     1    1    2
14AFIRST PART OF REG. NO. 1
0.01       E 00 1.0       E-04 1.7017   E-03                              0.
15

   THE NUMBER OF GEOMETRY INPUT POINTS EXCEEDS 14.

                        * DUE TO INPUT ERROR IT IS IMPOSSIBLE TO CHECK THE FOLLOWING CARDS UP TO THE DASH-SEPARATOR CARD. *


ORTHOTROPISTEEL     SINGLE     THICKNESS NOTHERMAL 0.0        LINEAR      2
 1.01      E-01 1.7016959E-01
2.36           2.36
```

```
     1    1    2
-----------------------------------------------------------------------------

14 SECOND PART OF REG. NO.1

   THE TYPE OF GEOMETRY OF A SEGMENT CANNOT BE IDENTIFIED AS ONE HANDLED BY THE PROGRAM.

    *   REGION NUMBER  1     SEGMENT NUMBER  2   *

  0.01      E 00 1.0      E-04 1.7017   E-03                              0.
14     .0000     .0000     .0000     .0000     .0000     .0000     .0000
       .0000     .0000     .0000     .0000     .0000     .0000     .0000
       .0000     .0000     .0000     .0000     .0000     .0000     .0000
       .0000     .0000     .0000     .0000     .0000     .0000     .0000
ORTHOTROPISTEEL     SINGLE     THICKNESS NOTHERMAL 0.0        LINEAR     2
    .1701696+00    .3403392+00
    .2360000+01    .2360000+01
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
    .0000000       .0000000
     2    2    3
-----------------------------------------------------------------------------

   THE RING CENTROID RADIUS IS ZERO.

   THE RING CENTROID RADIUS IS ZERO.

   THE RING CENTROID RADIUS IS ZERO.

   THE RING CENTROID RADIUS IS ZERO.
```

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

```
2 0    1 REGION  > 2 SEGMENTS
   2    2    3
11 FIRST  PART OF REG. NO. 2
 0.01      E 00 1.0       E-04 1.7017   E-03                              0.
 56.3          1.0
ORTHOTROPIST EEL     SINGLE     THICKNESS NOTHERMAL 0.0        LINEAR      2
   .3403392+00     .5105088+00
   .2360000+01     .2360000+01
   .0000000        .0000000
   .0000000        .0000000
   .0000000        .0000000
   .0000000        .0000000
    1    1    2
```

---

14 SECOND PART OF REG. NO.2

THE TYPE OF GEOMETRY OF A SEGMENT CANNOT BE IDENTIFIED AS ONE HANDLED BY THE PROGRAM.

• REGION NUMBER 2 SEGMENT NUMBER 2 •

0.01 E 00 1.0 E-04 1.7017 E-03 0.

15

THE NUMBER OF GEOMETRY INPUT POINTS EXCEEDS 14.

• DUE TO INPUT ERROR IT IS IMPOSSIBLE TO CHECK THE FOLLOWING CARDS UP TO THE DASH-SEPARATOR CARD. •

ORTHOTROPISTEEL SINGLE THICKNESS NOTHERMAL 0.0 LINEAR 2

5.10508780E-01 6.80678370E-01

2.36 2.36

2 2 3

---

3 29 0

THE NUMBER OF STRUCTURE RINGS EXCEEDS 28.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

THE RING CENTROID RADIUS IS ZERO.

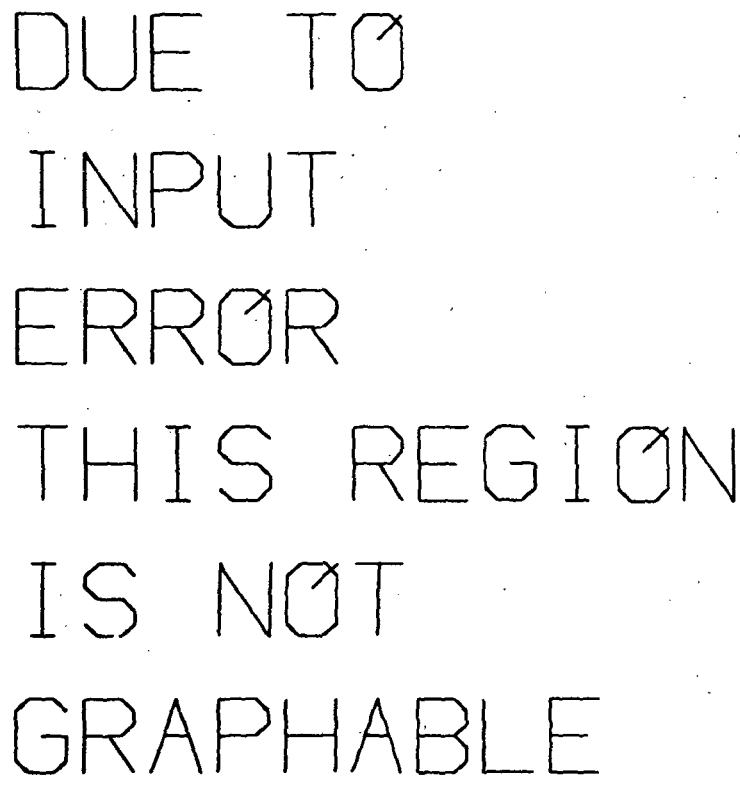
---

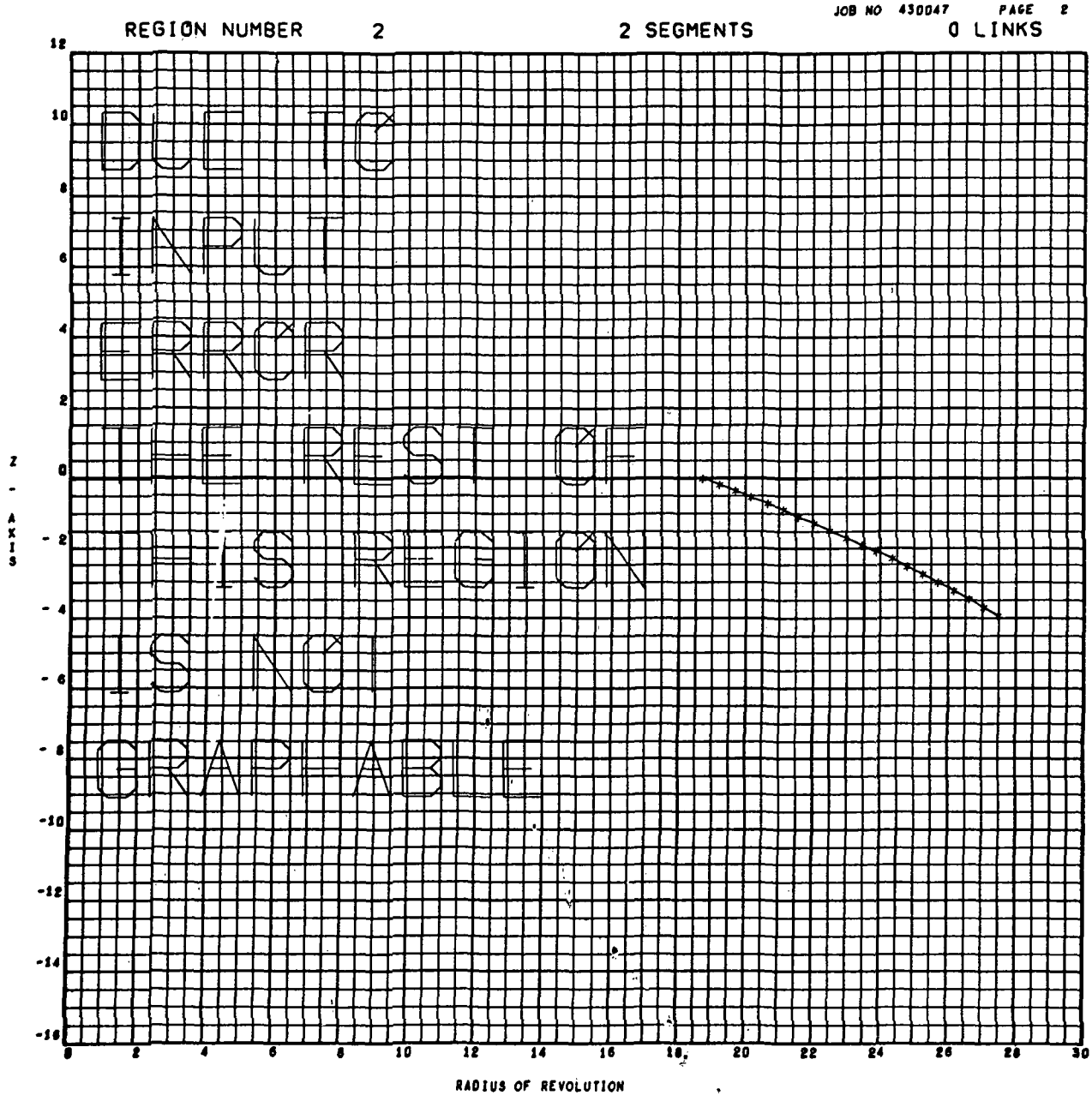
1 1 0 3 00.101
2 1 1 1 .1
3 0 0 0 0

---

64 ERRORS LOCATED.

REGION NUMBER 1 2 SEGMENTS 0 LINKS




JOB NO 430047 PAGE 2
REGION NUMBER 2
2 SEGMENTS
0 LINKS
DUE TO
INPUT
ERROR
THE REST OF
THIS REGION
IS NOT
GRADEABLE
Z - AXIS
RADIUS OF REVOLUTION

The second problem errors are as follows:

1. The recommended sizing for an annular plate segment has been violated in the first region, first segment.

2. The thermal clue THST is inconsistent with the first entry, "1", on the load clue card for the dead load.

3. The first entry on the load clue card for the live load actually causes three errors:

   a) Both dead and live loads cannot contain temperature.

   b) The entry, "5", is inconsistent with the thermal clue THST.

   c) The entry, "5", is invalid, and causes the program to scan further cards for the dash-separator card.

4. In the geometry table for the second segment, first region the following items are all zero: waffle grid spacing, core thickness of the basic sandwich wall, the sheet thickness of the basic sandwich wall.

5. The same thermal clue versus load clue errors are present in this segment as those discussed in items 2 and 3 above. The difference here is that the first entry on the live load clue card is "4", thus allowing a check of the load cards.

6. A check of the thermal loads against the appropriate material property table reveals that the table has an insufficient thermal range.

7. In the first segment, second region the following geometry table items are all zero: ring spacing, stringer spacing, the sheet thickness of the basic shell wall.

8. In the first segment, third region the following geometry table items are all zero: waffle grid spacing, the outside and inside sheet thickness of the basic sandwich shell wall, the core thickness of the basic sandwich shell wall.

9. The structure kinematic link cards are in reverse order.

10. Joint 1 must be zeroed out in all the boundary condition sets, due to the kinematic link connection.

11. The error count is printed as 33.

SATELLITE-1B

STARS-2B (BUCKLING) DATA DEBUGGING PROGRAM

VERSION DATE JULY 1, 1972

FOR INFORMATION CALL V. SVALBONAS
(516) 575-7701
P. OGILVIE

CYLINDER STABILITY TEST 24.0

3 4 2 0 1 1 2 3

NOTE - PREBUCKLING STATE WILL BE CALCULATED.

NOTE - BASIC EIGENVALUE CALCULATIONS WILL BE PERFORMED BY DETERMINANT EVALUATION.

STIF STIF

.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.1000000+08	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.1000000+08	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.3000000+00	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.1000000+08	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.1000000+08	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000

ALUM ISOT

.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.1000000+08	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.3000000+00	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000
.0000000	.0000000	.0000000	.0000000	.0000000

2 1

1 1 2

21 SHORT CYLINDER

3.250 E-01 1.0 E-04 0.325 E-010

0.0

ISOT ALUM SING THIC THST 0.0 LINE 2

.1000000-01	.4250000+01
.1000000+01	.1000000+01

FOR AN ANNULAR PLATE NEAR THE AXIS OF REVOLUTION, THE END POINT LOCATIONS SHOULD BE IN A RATIO BETWEEN .01 AND 100.

```
     *   REGION NUMBER   1      SEGMENT NUMBER   1      SEGMENT GEOMETRY TABLE ITEM  0    *

100000
    TEMPERATURE AND LOAD CLUES ARE INCONSISTENT.

     *   REGION NUMBER   1      SEGMENT NUMBER   1    *

     .0000000      -.1000000+02
501000
    TEMPERATURE CAN ONLY BE CONSIDERED IN EITHER THE PREBUCKLING STATE OR AS PART OF THE BUCKLING LOAD.

     *   REGION NUMBER   1      SEGMENT NUMBER   1    *

    TEMPERATURE AND LOAD CLUES ARE INCONSISTENT.

     *   REGION NUMBER   1      SEGMENT NUMBER   1    *

    THE LOAD INDICATOR CLUES CAN ONLY BE ZERO, BLANK, ONE, OR FOUR.

     *   REGION NUMBER   1      SEGMENT NUMBER   1    *

                              *   DUE TO INPUT ERROR IT IS IMPOSSIBLE TO CHECK THE FOLLOWING CARDS UP TO THE DASH-SEPARATOR CARD.   *

   20.          -10.
   20.
   20.
   20.
   100.         100.
     1    1     2
-------------------------------------------------------------------------------

   31  SHORT CYLINDER
    3.250   E-01   1.0     E-04   0.325   E-010.
   20.1
  STIF      STEE      BLAN      ISG2      THST      0.0       LINE      2
     .1000000+01    .4250000+01
     .0000000       .0000000
```

.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000
.0000000 .0000000

THE WAFFLE GRID SPACING IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE CORE THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 1 •

THE WAFFLE GRID SPACING IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE CORE THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

THE SHEET THICKNESS IS ZERO.

• REGION NUMBER 1 SEGMENT NUMBER 2 SEGMENT GEOMETRY TABLE ITEM 2 •

100000

```
      TEMPERATURE AND LOAD CLUES ARE INCONSISTENT.

     * REGION NUMBER  1    SEGMENT NUMBER  2 *

     .0000000    -.1000000+02
401000
      TEMPERATURE CAN ONLY BE CONSIDERED IN EITHER THE PREBUCKLING STATE OR AS PART OF THE BUCKLING LOAD.

     * REGION NUMBER  1    SEGMENT NUMBER  2 *

     .2000000+02  -.1000000+02
     .2000000+02   .0000000
     .2000000+02   .0000000
     .2000000+02   .0000000
     .1000000+03   .1000000+03
      2    3    4
      THE INTERPOLATED VALUE OF TEMPERATURE FOR USE IN THE MATERIAL PROPERTY TABLE IS GREATER THAN THE LAST VALUE OF TEMPERATURE.

     * REGION NUMBER  1    SEGMENT NUMBER  2   SEGMENT GEOMETRY TABLE ITEM  1 *

      THE INTERPOLATED VALUE OF TEMPERATURE FOR USE IN THE MATERIAL PROPERTY TABLE IS LESS THAN THE SECOND TEMPERATURE VALUE.

     * REGION NUMBER  1    SEGMENT NUMBER  2   SEGMENT GEOMETRY TABLE ITEM  2 *

   3 2  1.57079

   1 0
     2    2    3
  31  SHORT CYLINDER
  3.250   E-01  1.0     E-04  0.325   E-010.
  20.1
 STIF      STEE      ALAN      ST11      NOTH      0.0          2
     .1000000+01   .4250000+01
     .0000000      .0000000
     .0000000      .0000000
     .0000000      .0000000
```

```
 .0000000      .0000000
 .0000000      .0000000
 .0000000      .0000000
 .0000000      .0000000
 .0000000      .0000000
 .0000000      .0000000
 .0000000      .0000000
 .0000000      .0000000
 THE RING SPACING IS ZERO.

 *  REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  1  *

 THE STRINGER SPACING IS ZERO.

 *  REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  1  *

 THE SHEET THICKNESS IS ZERO.

 *  REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  1  *

 THE RING SPACING IS ZERO.

 *  REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2  *

 THE STRINGER SPACING IS ZERO.

 *  REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2  *

 THE SHEET THICKNESS IS ZERO.

 *  REGION NUMBER  2     SEGMENT NUMBER  1     SEGMENT GEOMETRY TABLE ITEM  2  *
```

```
000000
001000
    .1000000+03    .1000000+03
      1     1     2
-------------------------------------------------------------------------------

  1 9
     3     4     5
 31  SHORT CYLINDER
   3.250    E-01   1.0       E-04   0.325    E-010.
  20.2
 STIF        STEE        BLAN        RWA3        NOTH        0.0        LINE        2
     .1000000+01    .4250000+01
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000
     .0000000       .0000000

     THE WAFFLE GRID SPACING IS ZERO.

     * REGION NUMBER 3  SEGMENT NUMBER 1  SEGMENT GEOMETRY TABLE ITEM 1 *

     THE OUTSIDE SHEET THICKNESS IS ZERO.

     * REGION NUMBER 3  SEGMENT NUMBER 1  SEGMENT GEOMETRY TABLE ITEM 1 *

     THE CORE THICKNESS IS ZERO.

     * REGION NUMBER 3  SEGMENT NUMBER 1  SEGMENT GEOMETRY TABLE ITEM 1 *

     THE INSIDE SHEET THICKNESS IS ZERO.

     * REGION NUMBER 3  SEGMENT NUMBER 1  SEGMENT GEOMETRY TABLE ITEM 1 *
```

THE WAFFLE GRID SPACING IS ZERO.

• REGION NUMBER 3 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE OUTSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 3 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE CORE THICKNESS IS ZERO.

• REGION NUMBER 3 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

THE INSIDE SHEET THICKNESS IS ZERO.

• REGION NUMBER 3 SEGMENT NUMBER 1 SEGMENT GEOMETRY TABLE ITEM 2 •

000000
001000
.1000000+03 .1000000+03
1 1 2

---

5 0 2
4 3 1.57079
1 3 0.01

J-TH JOINTS ON SUCCESSIVE INTER-REGION KINEMATIC LINK CARDS MUST BE IN INCREASING ORDER.

---

1 0 1 1 1

DEGREES OF FREEDOM OF DEPENDENT (J) JOINT OF KINEMATIC LINKS MUST BE 'ZERUED OUT'.

2 0 0 1 0
3 0 0 1 0
4 0 0 0 0
5 0 1 1 1

```
      2
      1     1          1.E4
      1     6         -1.E4
```

```
1 0 1 0 1
```

DEGREES OF FREEDOM OF DEPENDENT (J) JOINT OF KINEMATIC LINKS MUST BE 'ZEROED-OUT'.

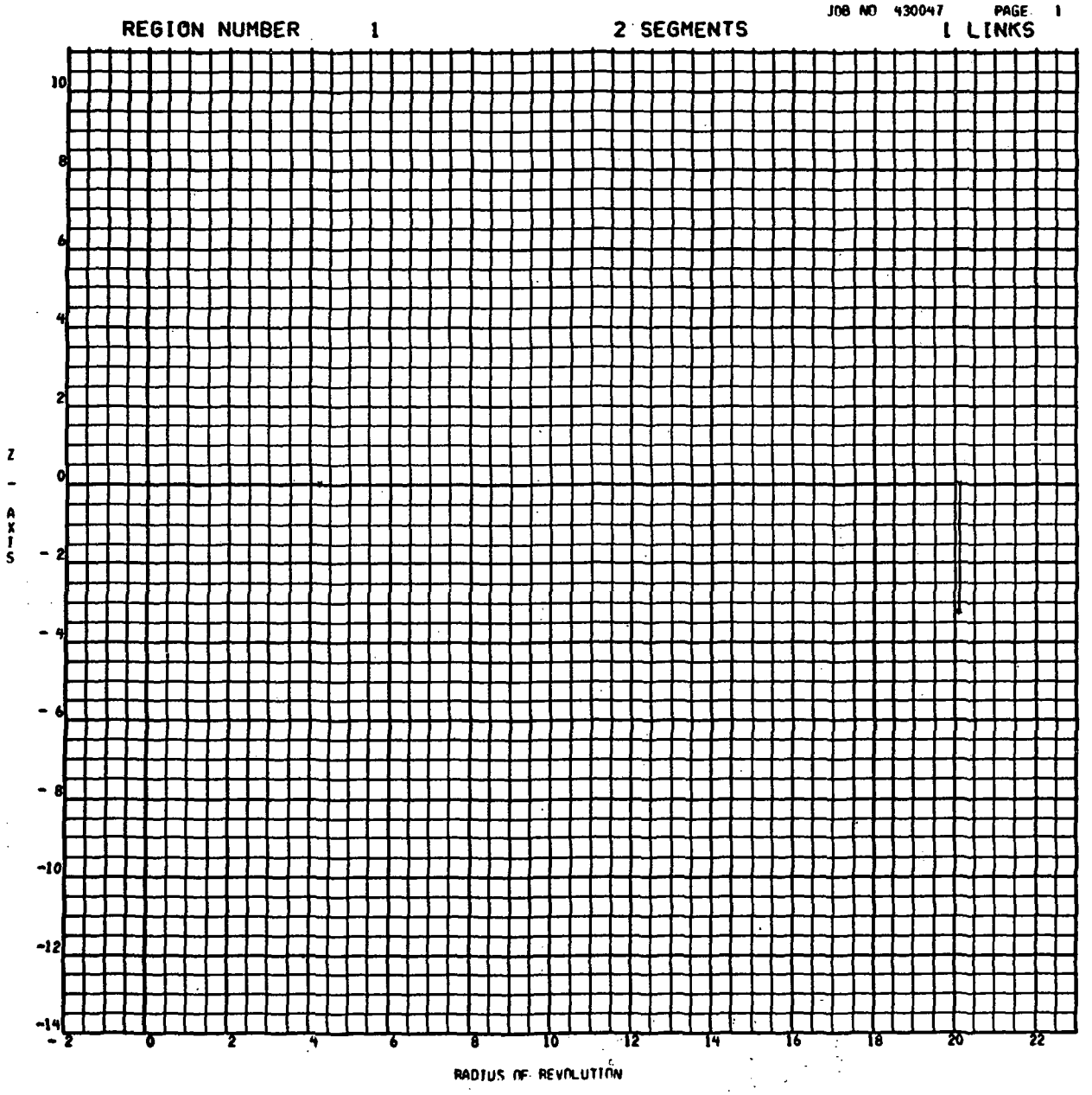
```
2 0 0 1 1
3 0 0 1 1
4 0 0 0 0
5 0 1 0 1
```

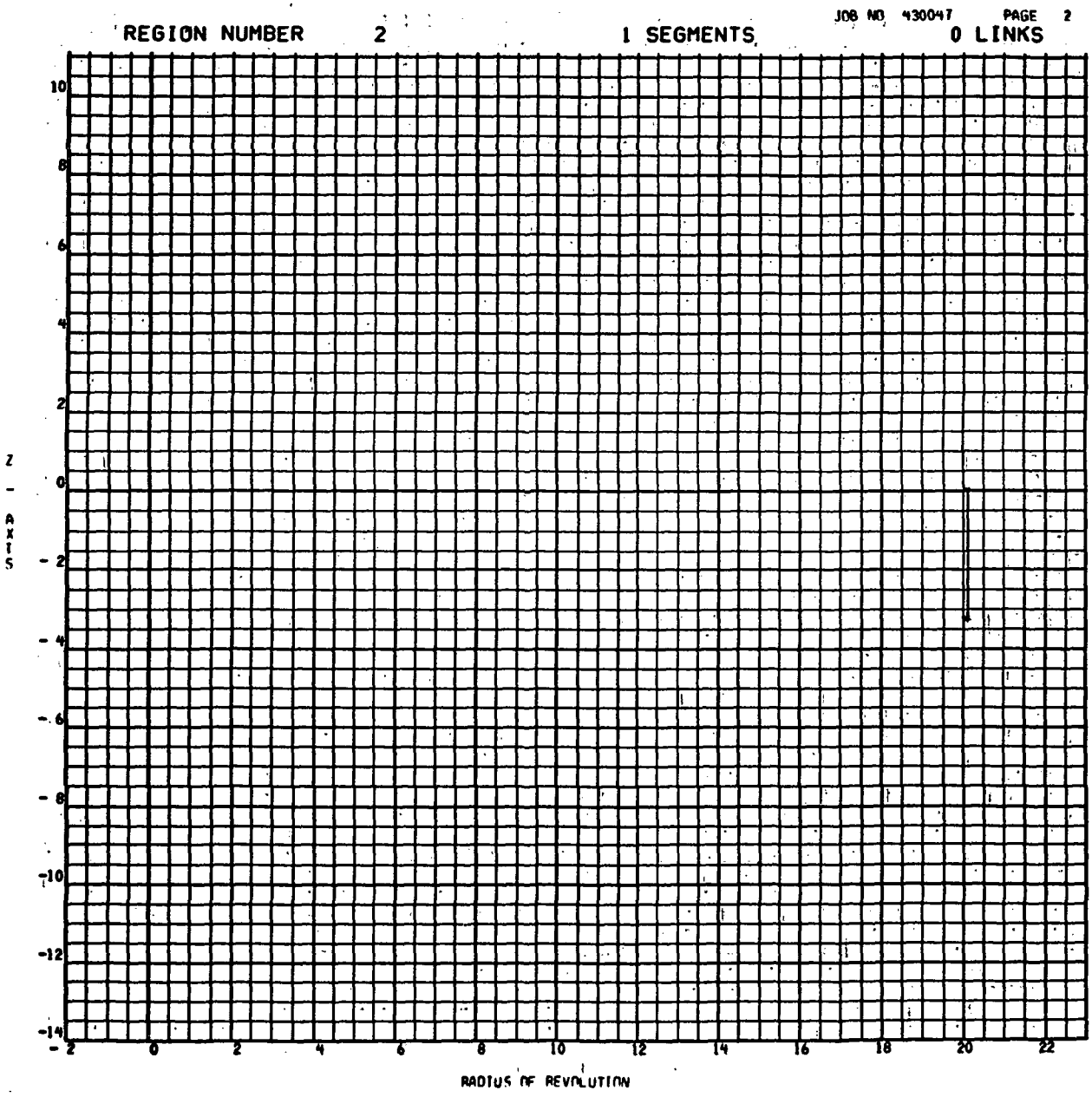
```
1 1 1 0 1
```

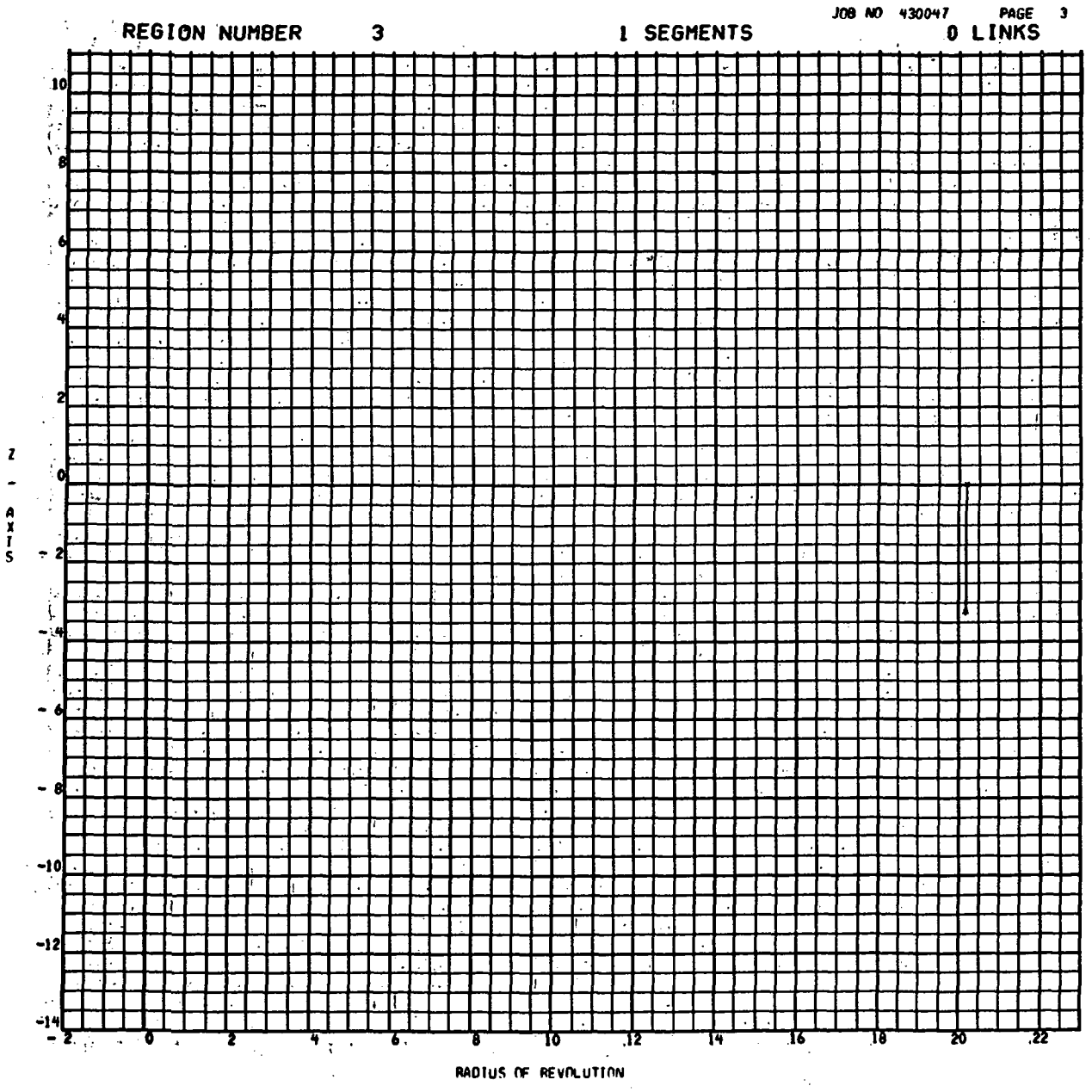
DEGREES OF FREEDOM OF DEPENDENT (J) JOINT OF KINEMATIC LINKS MUST BE 'ZEROED-OUT'.

```
2 1 0 1 1
3 1 0 1 1
4 0 0 0 0
5 1 1 0 1
```

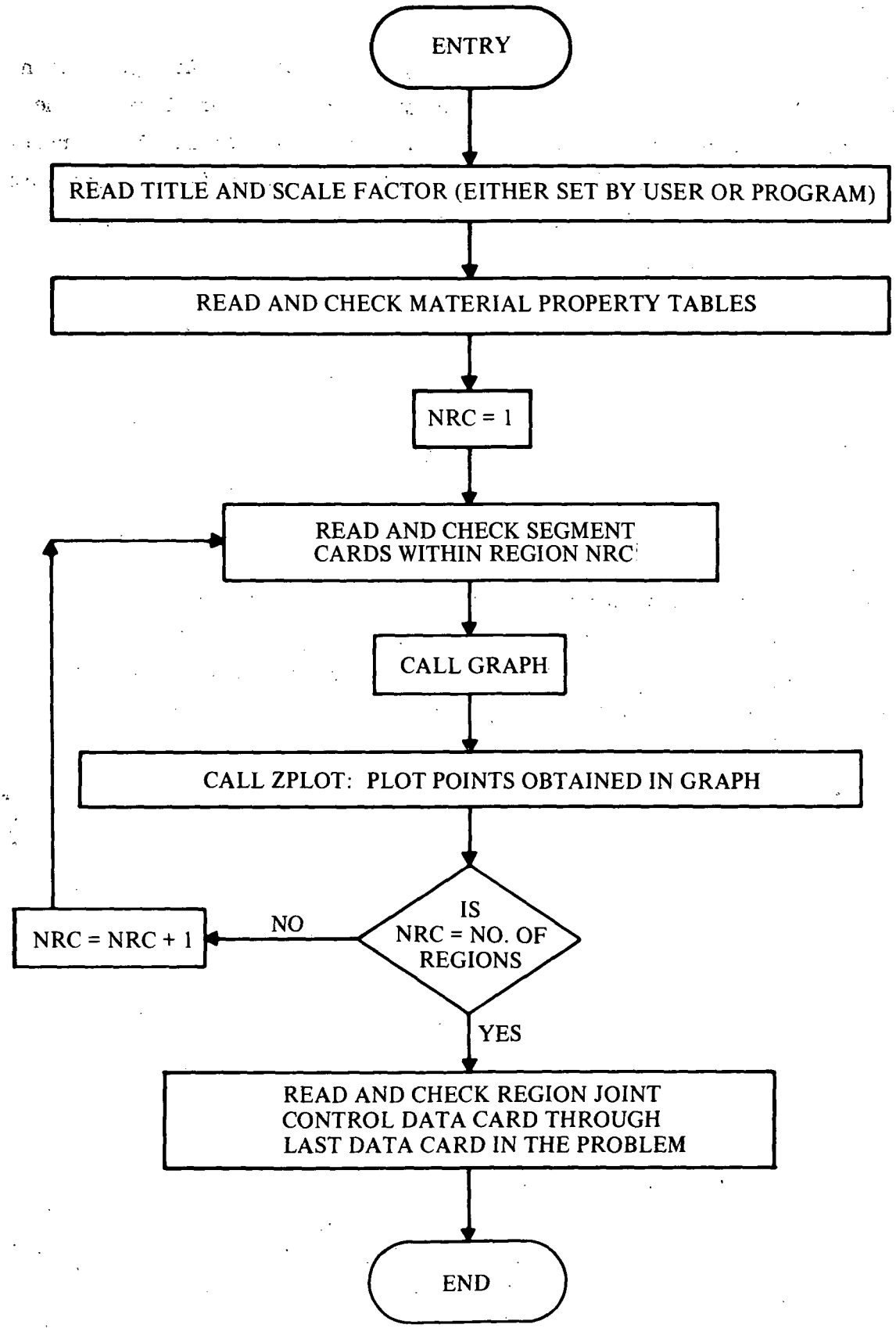
33 ERRORS LOCATED.


JOB NO 430047 PAGE 1
REGION NUMBER 1
2 SEGMENTS
1 LINKS
Z - AXIS
10
8
6
4
2
0
- 2
- 4
- 6
- 8
-10
-12
-14
- 2
0
2
4
6
8
10
12
14
16
18
20
22
RADIUS OF REVOLUTION


JOB NO 430047 PAGE 2
REGION NUMBER 2
1 SEGMENTS
0 LINKS
Z - AXIS
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-2
0
2
4
6
8
10
12
14
16
18
20
22
RADIUS OF REVOLUTION


JOB NO 430047 PAGE 3
REGION NUMBER 3
1 SEGMENTS
0 LINKS
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
Z - AXIS
-2
0
2
4
6
8
10
12
14
16
18
20
22
RADIUS OF REVOLUTION

The flow charts and listing of the SAT-1B program follow. As can be seen from the MAIN routine flow diagram the only major difference between the SAT-1S and SAT-1B programs is that the MAIN routine in SAT-1B also performs the operations of the subroutine BOZO (in SAT-1S). The GRAPH routines are essentially identical between the programs.


ENTRY
READ TITLE AND SCALE FACTOR (EITHER SET BY USER OR PROGRAM)
READ AND CHECK MATERIAL PROPERTY TABLES
NRC = 1
READ AND CHECK SEGMENT CARDS WITHIN REGION NRC
CALL GRAPH
CALL ZPLOT: PLOT POINTS OBTAINED IN GRAPH
IS NRC = NO. OF REGIONS
NO
NRC = NRC + 1
YES
READ AND CHECK REGION JOINT CONTROL DATA CARD THROUGH LAST DATA CARD IN THE PROBLEM
END

```
RUN,//T STARSS,430047,KEYJØHBIN214,1,500
ASG,T PUR,T,SAVE05
FREE TPF$.
ASG,T TPF$,F/1/PØS/10
FØR,IS BLDATA,BLDATA
C ..... RØUTINE **BLK DATA** ABACUS UPDATED 07/21/72 .....                    100000
      BLØCK DATA                                                             100010
      CØMMØN /NAM1/ FACE(4),STRGØ(7),THERM(4),MATER(3),SEGTAB(12)            100020
      DATA FACE/4HSING,4HEQUA,4HUNEQ,4HBLAN/                                 100030
      DATA STRGØ/11.0,13.0,21.0,31.0,12.0,14.0,15.0/                         100040
      DATA THERM/4HTHST,4HNØTH,4HTHCN,4HTHIN/                                100050
      DATA MATER/4HISØT,4HØRTH,4HSTIF/                                       100060
      DATA SEGTAB/4HST10,4HTHIC,4HRWAF,4HRWA1,4HRWA2,4HRWA3,4HISG1,          100070
     1           4HISG2,4HISG3,4HST11,4HST12,4HST13/                         100080
      END                                                                    100090
FØR,IS MAIN,MAIN
C ..... RØUTINE **MAINPRØG** ABACUS UPDATED 07/21/72 .....                   200000
C                                                                            200010
C     ***************************************************************        200020
C     *                                                             *        200030
C     *                          SATELLITE-1B                       *        200040
C     *                                                             *        200050
C     *                     DATA DEBUGGING PRØGRAM                  *        200060
C     *                            FØR                              *        200070
C     *                      STARS-2B (BUCKLING)                    *        200080
C     *                                                             *        200090
C     ***************************************************************        200100
C                                                                            200110
      INTEGER SAVJTC,SAVSTP,SEGTAB,THICK,TYPE                                200120
      INTEGER XN1,XN2,XN                                                     200130
      CØMMØN /NAM1/ FACE(4),STRGØ(7),THERM(4),MATER(3),SEGTAB(12)            200140
      CØMMØN/GRAPHS/STIC(30),STP(30),GG1(30),GG2(30),GG3(30),                200150
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NSKL ,       200160
     2JJT(30),IJT(30)                                                        200170
      CØMMØN /GPLØT/ ZZ(600),RRAD(600),NPT,NZR,DX                            200180
      CØMMØN /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,            200190
     1                PØLY(10),NCØEF                                         200200
      CØMMØN NERRØR,ICØUNT                                                   200210
      DIMENSIØN XDUM(6),JCHK(30)                                             200220
      DIMENSIØN XMAT(110,10),STD(10),NXMAT(20),LST(61),ST(70,31)             200230
      DIMENSIØN DLP(4),DUM(20)                                               200240
      DIMENSIØN NRZN(30),ZJ(14,30),RJ(14,30)                                 200250
      DIMENSIØN ANGL(30)                                                     200260
      EQUIVALENCE (DUM(1),D)                                                 200270
      DATA DLIMTR/4H----/,A/1HA/,B/1HB/                                      200280
 2000 FØRMAT(20A4)                                                           200290
 2001 FØRMAT(1X,20A4)                                                        200300
      IREGC = 1                                                              200310
    1 READ(5,1999,END=555) DX,DUM                                            200320
 1999 FØRMAT(60X,E10.0,T1,20A4)
      WRITE(6,1901)                                                          200340
 1901 FØRMAT(1H1,20(/),60X,12HSATELLITE-1B////45X,42HSTARS-2B (BUCKLING)     200350
     1 DATA DEBUGGING PRØGRAM////52X,27HVERSIØN DATE   JULY 1, 1972,         200360
     2  25(/),80X,35HFØR INFØRMATIØN CALL   V. SVALBØNAS/117X,14H(516) 5     
     375-7701/103X,10HP. ØGILVIE)                                            200380
      WRITE(6,1726)                                                          200390
 1726 FØRMAT(1H1)                                                            200400
      NIX = 0                                                                200410
      ICØUNT = 0                                                             200420
      WRITE(6,2001) DUM                                                      200430
      READ(5,1002) NREG,NSMAX,NMPT,XN1,XN2,INC,NPRØB,NBC,KBC,KEIG,DUM        200440
```

```
1002 FØRMAT(I2,I3,8I2,T1,20A4)                                          200450
     WRITE(6,2001) DUM                                                  200460
     IF (KBC.EQ.0) WRITE(6,1300)                                        200470
1300 FØRMAT(/48X,-NØTE - PREBUCKLING STATE WILL BE CALCULATED.-/)       200480
     IF (KBC.EQ.1) WRITE(6,1301)                                        200490
1301 FØRMAT(/48X,-NØTE - PRØGRAM EXPECTS THE PREBUCKLING STRESS STATE T 200500
    1Ø BE INPUT.-/)                                                     200510
     IF (KEIG.EQ.0) WRITE(6,1302)                                       200520
1302 FØRMAT(/48X,-NØTE - BASIC EIGENVALUE CALCULATIØNS WILL BE PERFØRME 200530
    1D BY DETERMINANT EVALUATIØN.-/)                                    200540
     IF (KEIG.EQ.1) WRITE(6,1303)                                       200550
1303 FØRMAT(/48X,-NØTE - BASIC EIGENVALUE CALCULATIØNS WILL BE PERFØRME 200560
    1D BY HØUSEHØLDER METHØD.-/)                                        200570
     NLCASE = NPRØB                                                     200630
     XN = 0                                                             200640
     JNBC = IABS(NBC)                                                   200650
     NRØW = 0                                                           200660
     KK = -1                                                            200670
     NSAVE = 0                                                          200680
     DØ 13 I=1,NMPT                                                     200690
     KK = KK+2                                                          200700
     NXMAT(KK) = NRØW+1                                                 200710
     II = NRØW+1                                                        200720
     READ(5,1004) STD(I),TYPE,DUM                                       200730
1004 FØRMAT(2(A4,6X),T1,20A4)                                           200740
     WRITE(6,2001) DUM                                                  200750
     NRØW = 11                                                          200760
     DØ 11 L=1,3                                                        200770
  11 IF (TYPE.EQ.MATER(L)) GØ TØ 12                                     200780
     NERRØR = 1                                                         200790
     CALL ETRAP                                                         200800
     STD(I) = DLIMTR                                                    200810
     WRITE(6,223)                                                       200820
 223 FØRMAT(28X,103H*   DUE TØ INPUT ERRØR IT IS IMPØSSIBLE TØ CHECK TH 200830
    1E FØLLØWING CARDS UP TØ THE DASH-SEPARATØR CARD.   */)             200840
     GØ TØ 2                                                            200850
  12 CØNTINUE                                                           200860
     IF (L.EQ.1) NRØW = 4                                               200870
     IF (L.EQ.2) NRØW = 7                                               200880
     LLL = NSAVE+NRØW                                                   200890
     READ(5,1005) ((XMAT(M,J),J=1,10),M=II,LLL)                         200900
1005 FØRMAT(5E14.7)                                                     200910
     WRITE(6,1205) ((XMAT(M,J),J=1,10),M=II,LLL)                        200920
1205 FØRMAT(1X,5E14.7)                                                  200930
     DØ 608 M=3,10                                                      200940
     IF (XMAT(II,M-1).LT.XMAT(II,M)) GØ TØ 608                          200950
     IF (XMAT(II,M).EQ.0.0) GØ TØ 608                                   200960
     NERRØR = 32                                                        200970
     CALL ETRAP                                                         200980
     STD(I) = 0                                                         200990
 608 CØNTINUE                                                           201000
     NRØW = NSAVE+NRØW                                                  201010
     NXMAT(KK+1) = LLL                                                  201020
  13 NSAVE = NRØW                                                       201030
   2 READ(5,2000) DUM                                                   201040
     WRITE(6,2001) DUM                                                  201050
     IF (D.NE.DLIMTR) GØ TØ 2                                           201060
     WRITE(6,222)                                                       201070
 222 FØRMAT(/)                                                          201080
     DØ 99 NRC=1,NREG                                                   201090
     READ(5,1003) NST,NKL,NRING,DUM                                     201100
```

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 1003 FØRMAT(3I2,T1,20A4)                                                201110
      WRITE(6,2001) DUM                                                  201120
      IF (NRING.LE.28) GØ TØ 214                                         201130
      NERRØR = 37                                                        201140
      CALL ETRAP                                                         201150
      WRITE(6,996) NRC                                                   201160
  996 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,-   *-///)                      201170
  214 CØNTINUE                                                           201180
      READ(5,1006) JRTIC,JRSTØP,DUM                                      201190
 1006 FØRMAT(5X,2I5,T1,20A4)                                             201200
      WRITE(6,2001) DUM                                                  201210
      NSEG = NST                                                         201220
      NSC = 0                                                            201230
  101 NSC = NSC+1                                                        201240
      NCHK = 0                                                           201250
      READ(5,1011) RGØ,ANG,DUM                                           201260
 1011 FØRMAT(F2.0,A1,T1,20A4)                                            201270
      WRITE(6,2001) DUM                                                  201280
C     GEØMETRY IDENTIFICATIØN SEARCH                                     201290
      DØ 504 I=1,7                                                       201300
  504 IF (RGØ.EQ.STRGØ(I)) GØ TØ 505                                     201310
      NERRØR = 2                                                         201320
      NCHK = 1                                                           201330
      CALL ETRAP                                                         201340
      WRITE(6,999) NRC,NSC                                               201350
  505 KGEØM = I                                                          201360
      MGEØM(NSC) = KGEØM                                                 201370
      IF (KGEØM.EQ.5) WRITE(6,1233)                                      201380
 1233 FØRMAT(/60X,-NØTE - FØR PLØT RØUTINE A/B=1.5, N=0 WILL BE USED.-/) 201390
      IF (RGØ.NE.14.0) GØ TØ 280                                         201400
      ANGL(NSC) = ANG                                                    201410
      IF (ANG.EQ.A.ØR.ANG.EQ.B) GØ TØ 280                                201420
      NERRØR = 2                                                         201430
      NCHK = 1                                                           201440
      CALL ETRAP                                                         201450
      WRITE(6,999) NRC,NSC                                               201460
  280 CØNTINUE                                                           201470
      READ(5,1012) DTAU,DIFF,STEP,DELTA,DUM                              201480
 1012 FØRMAT(3E14.1,28X,F2.0,T1,20A4)                                    201490
      WRITE(6,2001) DUM                                                  201500
      IF (RGØ.EQ.14.0) GØ TØ 180                                         201510
      READ(5,1015) G1,G2,G3,DUM                                          201520
 1015 FØRMAT(3E14.1,T1,20A4)                                             201530
      WRITE(6,2001) DUM                                                  201540
      GG1(NSC) = G1                                                      201550
      GG2(NSC) = G2                                                      201560
      GG3(NSC) = G3                                                      201570
      GØ TØ 188                                                          201580
  180 READ(5,182) NRZIN,(ZI(J),RI(J),J=1,3),ZI(4),DUM                    201590
  182 FØRMAT(I2,7F10.0,T1,20A4)                                          201600
      NRZN(NSC) = NRZIN                                                  201610
      IF (NRZIN.LE.14) GØ TØ 181                                         201620
      WRITE(6,2001) DUM                                                  201630
      NERRØR = 39                                                        201640
      NCHK = 1                                                           201650
      CALL ETRAP                                                         201660
      WRITE(6,223)                                                       201670
      GØ TØ 3                                                            201680
  181 IF (NRZIN.LE.3) GØ TØ 185                                          201690
      IF (NRZIN.EQ.4) READ(5,186) RI(4)                                  201700
  186 FØRMAT(7F10.0)                                                     201710
```

```
      IF (NRZIN.GT.4) READ(5,186) RI(4),(ZI(J),RI(J),J=5,NRZIN)          201720
  185 CONTINUE                                                           201730
      WRITE(6,183) NRZIN,(ZI(J),RI(J),J=1,NRZIN)                         201740
  183 FORMAT(1X,I2,7F10.4/(1X,7F10.4))                                   201750
      DO 190 J=1,NRZIN                                                   201760
      ZJ(J,NSC) = ZI(J)                                                  201770
  190 RJ(J,NSC) = RI(J)                                                  201780
  188 CONTINUE                                                           201790
      READ(5,1013) TYPE,HLAYR,SHEET,INTERP,RANKIN,TEFREE,NP,DUM          201800
 1013 FORMAT(5(A4,6X),E10.1,10X,I2,T1,20A4)                              201810
      WRITE(6,2001) DUM                                                  201820
      ICHK = 0                                                           201830
C     MATERIAL PROPERTY IDENTIFICATION                                   201840
      DO 501 I=1,NMPT                                                    201850
  501 IF (HLAYR.EQ.STD(I)) GO TO 502                                     201860
      NERROR = 4                                                         201870
      CALL ETRAP                                                         201880
      WRITE(6,999) NRC,NSC                                               201890
      ICHK = 2                                                           201900
  502 MAT = I                                                            201910
      DO 506 I=1,3                                                       201920
  506 IF (TYPE.EQ.MATER(I)) GO TO 507                                    201930
      NERROR = 5                                                         201940
      CALL ETRAP                                                         201950
      WRITE(6,999) NRC,NSC                                               201960
  507 ITYPE = I                                                          201970
      DO 510 I=1,12                                                      201980
  510 IF (INTERP.EQ.SEGTAB(I)) GO TO 511                                 201990
      NERROR = 6                                                         202000
      CALL ETRAP                                                         202010
      WRITE(6,999) NRC,NSC                                               202020
      ICHK = 1                                                           202030
  511 ISTTAB = I                                                         202040
      KLUE2 = 1                                                          202050
      IF (ISTTAB.GE.3.AND.ISTTAB.LE.6) KLUE2 = 2                         202060
      DO 508 I=1,4                                                       202070
  508 IF (SHEET.EQ.FACE(I)) GO TO 509                                    202080
      NERROR = 7                                                         202090
      CALL ETRAP                                                         202100
      WRITE(6,999) NRC,NSC                                               202110
      ICHK = 1                                                           202120
  509 THICK = I                                                          202130
C     TEMPERATURE LOAD IDENTIFICATION                                    202140
      DO 401 I=1,4                                                       202150
  401 IF (RANKIN.EQ.THERM(I)) GO TO 402                                  202160
      NERROR = 8                                                         202170
      CALL ETRAP                                                         202180
      WRITE(6,999) NRC,NSC                                               202190
      I = 5                                                              202200
  402 KELVIN = I                                                         202210
      IF (NP.GE.2.AND.NP.LE.30) GO TO 191                                202220
      NERROR = 3                                                         202230
      NCHK = 1                                                           202240
      CALL ETRAP                                                         202250
      WRITE(6,999) NRC,NSC                                               202260
  999 FORMAT(/5X,-*   REGION NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,-    *- 202270
     1       ///)                                                        202280
      WRITE(6,223)                                                       202290
      GO TO 3                                                            202300
  191 CONTINUE                                                           202310
      IF (ICHK.EQ.1) WRITE(6,223)                                        202320
```

```
      IF (ICHK.EQ.1) GØ TØ 3                                            202330
      NRØW = THICK+1                                                    202340
      IF (ISTTAB.EQ.1) NRØW = 11                                        202350
      IF (ISTTAB.EQ.3) NRØW = 13                                        202360
      IF (ISTTAB.EQ.4) NRØW = 8                                         202370
      IF (ISTTAB.EQ.5) NRØW = 9                                         202380
      IF (ISTTAB.EQ.6) NRØW = 10                                        202390
      IF (ISTTAB.EQ.7) NRØW = 7                                         202400
      IF (ISTTAB.EQ.8) NRØW = 8                                         202410
      IF (ISTTAB.EQ.9) NRØW = 9                                         202420
      IF (ISTTAB.EQ.10) NRØW = 12                                       202430
      IF (ISTTAB.EQ.11) NRØW = 13                                       202440
      IF (ISTTAB.EQ.12) NRØW = 14                                       202450
      IF (KBC.NE.0) NRØW = NRØW+2*NLCASE                                202460
      DØ 901 I=1,NRØW                                                  202470
      READ(5,1005) (ST(I,J),J=1,NP)                                     202480
      WRITE(6,1205) (ST(I,J),J=1,NP)                                    202490
  901 CØNTINUE                                                          202500
      STIC(NSC) = ST(1,1)                                               202510
      STP(NSC) = ST(1,NP)                                               202520
      IF (G1.EQ.0.0.AND.KGEØM.EQ.3) GØ TØ 902                           202530
      GØ TØ 903                                                         202540
  902 S = ST(1,1)/ST(1,NP)                                              202550
      IF (0.01.LT.S.AND.S.LT.100.0) GØ TØ 903                           202560
      NERRØR = 33                                                       202570
      CALL ETRAP                                                        202580
      WRITE(6,998) NRC,NSC,LL                                           202590
  903 CØNTINUE                                                          202600
      DØ 2108 LL=1,NP                                                   202610
      HØ = 1.0                                                          202620
      T = 1.0                                                           202630
      GØ TØ (711,600,711,32,33,34,32,33,34,28,29,30),ISTTAB             202640
  600 GØ TØ (701,702,703),THICK                                         202650
  703 HØ = ST(4,LL)                                                     202660
  702 T = ST(3,LL)                                                      202670
  701 HI = ST(2,LL)                                                     202680
      GØ TØ 714                                                         202690
  711 CØNTINUE                                                          202700
      XK11 = ST(2,LL)                                                   202710
      XK12 = ST(3,LL)                                                   202720
      XK22 = ST(4,LL)                                                   202730
      XK33 = ST(5,LL)                                                   202740
      XD11 = ST(6,LL)                                                   202750
      XD12 = ST(7,LL)                                                   202760
      XD22 = ST(8,LL)                                                   202770
      XD33 = ST(9,LL)                                                   202780
      XK21 = XK12                                                       202790
      XD21 = XD12                                                       202800
      GØ TØ 814                                                         202810
   34 HØ = ST(9,LL)                                                     202820
   33 T = ST(8,LL)                                                      202830
   32 HI = ST(7,LL)                                                     202840
      SPH = ST(5,LL)                                                    202850
      IF (SPH.NE.0.0) GØ TØ 714                                         202860
      NERRØR = 9                                                        202870
      CALL ETRAP                                                        202880
      WRITE(6,998) NRC,NSC,LL                                           202890
      GØ TØ 714                                                         202900
   30 HØ = ST(14,LL)                                                    202910
   29 T = ST(13,LL)                                                     202920
   28 HI = ST(12,LL)                                                    202930
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```
      SPH = ST(10,LL)                                                   202940
      STH = ST(11,LL)                                                   202950
      IF (STH.NE.0.0) GØ TØ 850                                         202960
      NERRØR = 10                                                       202970
      CALL ETRAP                                                        202980
      WRITE(6,998) NRC,NSC,LL                                           202990
  850 IF (SPH.NE.0.0) GØ TØ 714                                         203000
      NERRØR = 11                                                       203010
      CALL ETRAP                                                        203020
      WRITE(6,998) NRC,NSC,LL                                           203030
  714 CØNTINUE                                                          203040
      IF (HØ.NE.0.0) GØ TØ 802                                          203050
      NERRØR = 12                                                       203060
      CALL ETRAP                                                        203070
      WRITE(6,998) NRC,NSC,LL                                           203080
  802 IF (T.NE.0.0) GØ TØ 801                                           203090
      NERRØR = 13                                                       203100
      CALL ETRAP                                                        203110
      WRITE(6,998) NRC,NSC,LL                                           203120
  801 IF (HI.NE.0.0) GØ TØ 814                                          203130
      IF (ISTTAB.EQ.6.ØR.ISTTAB.EQ.9.ØR.ISTTAB.EQ.12.ØR.(ISTTAB.EQ.2.AND 203140
     1.THICK.EQ.3)) GØ TØ 710                                           203150
      NERRØR = 14                                                       203160
      GØ TØ 712                                                         203170
  710 NERRØR = 15                                                       203180
  712 CALL ETRAP                                                        203190
      WRITE(6,998) NRC,NSC,LL                                           203200
  814 CØNTINUE                                                          203210
      IF (ITYPE.NE.3) GØ TØ 2108                                        203220
      IF (ISTTAB.NE.1.AND.ISTTAB.NE.3) GØ TØ 2108                       203230
      IF (XK11.NE.0.0) GØ TØ 2101                                       203240
      NERRØR = 16                                                       203250
      CALL ETRAP                                                        203260
      WRITE(6,998) NRC,NSC,LL                                           203270
 2101 IF (XK12.NE.0.0) GØ TØ 2104                                       203280
      NERRØR = 17                                                       203290
      CALL ETRAP                                                        203300
      WRITE(6,998) NRC,NSC,LL                                           203310
 2104 IF (XK21.NE.0.0) GØ TØ 2105                                       203320
      NERRØR = 18                                                       203330
      CALL ETRAP                                                        203340
      WRITE(6,998) NRC,NSC,LL                                           203350
 2105 IF (XK22.NE.0.0) GØ TØ 2106                                       203360
      NERRØR = 19                                                       203370
      CALL ETRAP                                                        203380
      WRITE(6,998) NRC,NSC,LL                                           203390
 2106 IF (XK33.NE.0.0) GØ TØ 2109                                       203400
      NERRØR = 20                                                       203410
      CALL ETRAP                                                        203420
      WRITE(6,998) NRC,NSC,LL                                           203430
 2109 IF (XD11.NE.0.0) GØ TØ 2110                                       203440
      NERRØR = 21                                                       203450
      CALL ETRAP                                                        203460
      WRITE(6,998) NRC,NSC,LL                                           203470
 2110 IF (XD12.NE.0.0) GØ TØ 2102                                       203480
      NERRØR = 22                                                       203490
      CALL ETRAP                                                        203500
      WRITE(6,998) NRC,NSC,LL                                           203510
 2102 IF (XD21.NE.0.0) GØ TØ 2103                                       203520
      NERRØR = 23                                                       203530
      CALL ETRAP                                                        203540
```

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      WRITE(6,998) NRC,NSC,LL                                                  203550
 2103 IF (XD22.NE.0.0) GØ TØ 2107                                              203560
      NERRØR = 24                                                              203570
      CALL ETRAP                                                               203580
      WRITE(6,998) NRC,NSC,LL                                                  203590
 2107 IF (XD33.NE.0.0) GØ TØ 2108                                              203600
      NERRØR = 25                                                              203610
      CALL ETRAP                                                               203620
      WRITE(6,998) NRC,NSC,LL                                                  203630
 2108 CØNTINUE                                                                 203640
      IF (KBC.NE.0) GØ TØ 590                                                  203650
      K = NRØW+1                                                               203660
      JJ = 1                                                                   203670
      JJJ = 6                                                                  203680
      MM = 1                                                                   203690
      LST(7) = 0                                                               203700
      DØ 17 NLC=1,NLCASE                                                       203710
      JT = JJ                                                                  203720
      JTT = JJJ                                                                203730
      L = 0                                                                    203740
      READ(5,1014) (LST(J),J=JJ,JJJ),DUM                                       203750
 1014 FØRMAT(6I1,T1,20A4)                                                      203760
      WRITE(6,2001) DUM                                                        203770
      IF (LST(JJ)) 8031,19,20                                                  203780
   20 L = LST(JJ)                                                              203790
      IF (LST(1).EQ.0.ØR.LST(JT).EQ.0) GØ TØ 1026                              203800
      IF (NLC.EQ.1) GØ TØ 1026                                                 203810
      NERRØR = 26                                                              203820
      CALL ETRAP                                                               203830
      WRITE(6,999) NRC,NSC                                                     203840
 1026 IF ((LST(1).NE.1.AND.LST(JT).NE.1).AND.(KELVIN.EQ.3.ØR.KELVIN.EQ.4       203850
     1)) GØ TØ 1027                                                           203860
      GØ TØ 1028                                                               203870
 1027 NERRØR = 35                                                              203880
      CALL ETRAP                                                               203890
      WRITE(6,999) NRC,NSC                                                     203900
 1028 IF ((LST(1).NE.4.AND.LST(JT).NE.4).AND.KELVIN.EQ.1) GØ TØ 1029           203910
      GØ TØ 1025                                                               203920
 1029 NERRØR = 35                                                              203930
      CALL ETRAP                                                               203940
      WRITE(6,999) NRC,NSC                                                     203950
 1025 IF (L.NE.1.AND.L.NE.4) GØ TØ 8031                                        203960
      GØ TØ 19                                                                 203970
 8031 NERRØR = 27                                                              203980
      CALL ETRAP                                                               203990
      WRITE(6,999) NRC,NSC                                                     204000
      WRITE(6,223)                                                             204010
      GØ TØ 3                                                                  204020
   19 JJ = JJ+1                                                                204030
      IF (L.NE.0.AND.KELVIN.EQ.2) GØ TØ 8075                                   204040
      GØ TØ 23                                                                 204050
 8075 NERRØR = 35                                                              204060
      CALL ETRAP                                                               204070
      WRITE(6,999) NRC,NSC                                                     204080
   23 IF (LST(JJ)) 8032,22,21                                                  204090
   21 L = L+1                                                                  204100
      IF (LST(JJ).NE.1) GØ TØ 8032                                             204110
   22 IF (JJ.EQ.JJJ) GØ TØ 24                                                  204120
      JJ = JJ+1                                                                204130
      GØ TØ 23                                                                 204140
 8032 NERRØR = 27                                                              204150
```

```
      CALL ETRAP                                                        204160
      WRITE(6,999) NRC,NSC                                              204170
      WRITE(6,223)                                                      204180
      GØ TØ 3                                                           204190
   24 IF (L.EQ.0) GØ TØ 71                                              204200
      IF (ICHK.EQ.2.AND.LST(JJ-5).NE.0) WRITE(6,223)                    204210
      LY = K                                                            204220
      KK = K+L-1                                                        204230
      DØ 72 M=K,KK                                                      204240
      READ(5,1005) (ST(M,J),J=1,NP)                                     204250
      WRITE(6,1205) (ST(M,J),J=1,NP)                                    204260
   72 CØNTINUE                                                          204270
      IF (LST(JT).EQ.0) GØ TØ 71                                        204280
      K = K+LST(1)                                                      204290
   71 K = K+L-LST(JT)                                                   204300
      JJ = JJJ+1                                                        204310
      JJJ = JJ+5                                                        204320
   17 MM = MM+1                                                         204330
  590 CØNTINUE                                                          204340
      READ(5,591) IS,SAVJTC,SAVSTP,DUM                                  204350
  591 FØRMAT(3I5,T1,20A4)                                               204360
      WRITE(6,2001) DUM                                                 204370
      IJT(NSC) = SAVJTC                                                 204380
      JJT(NSC) = SAVSTP                                                 204390
C     THE UPDATED INTERPØLATED VALUES ØF THE MATERIAL PRØPERTY CØEFFIC  204400
C     IENTS ARE FØUND IN THE XMAT TABLE AND STØRED IN THE XLAYER ARRAY  204410
      IF (LST(1).EQ.0.AND.LST(7).EQ.0) GØ TØ 3                          204420
      IF (ICHK.EQ.2) GØ TØ 3                                            204430
      IF (KELVIN.NE.5) GØ TØ 125                                        204440
      IF (LST(1).EQ.1.ØR.LST(7).EQ.1) KELVIN = 3                        204450
      IF (LST(1).EQ.4.ØR.LST(7).EQ.4) KELVIN = 1                        204460
  125 CØNTINUE                                                          204470
      DØ 123 LL=1,NP                                                    204480
      L=(MAT-1)*2+1                                                     204490
      II=NXMAT(L)                                                       204500
       III=NXMAT(L+1)                                                   204510
      M=1                                                               204520
      GØ TØ (91,123,93,93),KELVIN                                       204530
   91 TEMPAV = (ST(LY,LL)+ST(LY+1,LL)+ST(LY+2,LL)+ST(LY+3,LL))/4.0      204540
      ARG=TEMPAV                                                        204550
      GØTØ 94                                                           204560
   93 ARG = ST(NRØW + 1,LL)                                             204570
   94 DØ 104 I = 2,10                                                   204580
      IF (ARG-XMAT(II,I)) 121,123,104                                   204590
  121 IF (I-2) 8007,8007,123                                            204600
 8007 NERRØR = 28                                                       204610
      CALL ETRAP                                                        204620
      WRITE(6,998) NRC,NSC,LL                                           204630
  998 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,5X,    204640
     1       -SEGMENT GEØMETRY TABLE ITEM -,I2,-   *-///)               204650
      GØ TØ 123                                                         204660
  104 CØNTINUE                                                          204670
      NERRØR = 29                                                       204680
      CALL ETRAP                                                        204690
      WRITE(6,998) NRC,NSC,LL                                           204700
  123 CØNTINUE                                                          204710
    3 READ(5,2000) DUM                                                  204720
      WRITE(6,2001) DUM                                                 204730
      IF (D.NE.DLIMTR) GØ TØ 3                                          204740
      WRITE(6,222)                                                      204750
      JCHK(NSC) = NCHK                                                  204760
```

```
      IF (NSC.LT.NSEG) GØ TØ 101                                        204770
      NSC = 0                                                           204780
      IF (NRING.EQ.0) GØ TØ 210                                         204790
      DØ 211 I=1,NRING                                                  204800
      READ(5,720) JTNØ,(XDUM(J),J=1,5),DUM                              204810
  720 FØRMAT(I2,5E14.7,T1,20A4)                                         204820
      WRITE(6,2001) DUM                                                 204830
      READ(5,721) XDUM,DUM                                              204840
  721 FØRMAT(6E12.5,T1,20A4)                                            204850
      WRITE(6,2001) DUM                                                 204860
      IF (XDUM(2)) 780,780,781                                          204870
  780 WRITE(6,782)                                                      204880
  782 FØRMAT(/  4X,-THE RING CENTRØID RADIUS IS ZERØ.-/)                 204890
      ICØUNT = ICØUNT+1                                                 204900
  781 CØNTINUE                                                          204910
      READ(5,722) (XDUM(J),J=1,5),DUM                                   204920
  722 FØRMAT(5E14.7,T1,20A4)                                            204930
  211 WRITE(6,2001) DUM                                                 204940
  680 READ(5,2000) DUM                                                  204950
      WRITE(6,2001) DUM                                                 204960
      IF (D.NE.DLIMTR) GØ TØ 680                                        204970
      WRITE(6,222)                                                      204980
  210 CØNTINUE                                                          204990
      NSKL = NKL                                                        205000
      IF (NSKL.EQ.0) GØ TØ 95                                           205010
      DØ 103 NRIG=1,NSKL                                                205020
      READ(5,503) JDEP,JIND,ANGLE,DUM                                   205030
  503 FØRMAT(2I2,E14.7,T1,20A4)                                         205040
      WRITE(6,2001) DUM                                                 205050
      JLINK(NRIG) = JDEP                                                205060
      ILINK(NRIG) = JIND                                                205070
      ANGLNK(NRIG) = ANGLE                                              205080
      IF (JIND.LT.JDEP) GØ TØ 103                                       205090
      NERRØR = 30                                                       205100
      CALL ETRAP                                                        205110
  103 CØNTINUE                                                          205120
    4 READ(5,2000) DUM                                                  205130
      WRITE(6,2001) DUM                                                 205140
      IF (D.NE.DLIMTR) GØ TØ 4                                          205150
      WRITE(6,222)                                                      205160
   95 NSEG = NST                                                        205170
      NLINK = NKL                                                       205180
      DØ 3030 ISEG = 1,NSEG                                             205190
      NCHK = JCHK(ISEG)                                                 205200
      KSEG = ISEG                                                       205210
      IF (MGEØM(ISEG).NE.6) GØ TØ 195                                   205220
      ANG = ANGL(ISEG)                                                  205230
      NRZIN = NRZN(ISEG)                                                205240
      IF (NRZIN.GE.15) GØ TØ 195                                        205250
      DØ 192 I=1,NRZIN                                                  205260
      ZI(I) = ZJ(I,ISEG)                                                205270
  192 RI(I) = RJ(I,ISEG)                                                205280
  195 CØNTINUE                                                          205290
      CALL GRAPH (NCHK,NRC)                                             205300
      IF (NCHK.EQ.1) GØ TØ 3031                                         205310
 3030 CØNTINUE                                                          205320
 3031 NZR = NRC                                                         205330
      JCLUE = 0                                                         205340
      IF (NCHK.EQ.1.AND.KSEG.EQ.1) JCLUE = 1                            205350
      IF (NCHK.EQ.1.AND.KSEG.GT.1) JCLUE = 2                            205360
      CALL ZPLØT (JCLUE)                                                205370
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 99 CØNTINUE                                                          205380
    READ(5,601) NØJ,NØRING,NLINK,DUM                                  205390
601 FØRMAT(3I5,T1,20A4)                                               205400
    WRITE(6,2001) DUM                                                 205410
    IF (NØRING.LE.28) GØ TØ 750                                       205420
    NERRØR = 38                                                       205430
    CALL ETRAP                                                        205440
750 CØNTINUE                                                          205450
    IF (NØRING.EQ.0) GØ TØ 751                                        205460
    DØ 752 I=1,NØRING                                                 205470
    READ(5,720) JTNØ,(XDUM(J),J=1,5),DUM                              205480
    WRITE(6,2001) DUM                                                 205490
    READ(5,721) XDUM,DUM                                              205500
    WRITE(6,2001) DUM                                                 205510
    IF (XDUM(2)) 783,783,784                                          205520
783 WRITE(6,782)                                                      205530
    ICØUNT = ICØUNT+1                                                 205540
784 CØNTINUE                                                          205550
    READ(5,722) (XDUM(J),J=1,5),DUM                                   205560
752 WRITE(6,2001) DUM                                                 205570
681 READ(5,2000) DUM                                                  205580
    WRITE(6,2001) DUM                                                 205590
    IF (D.NE.DLIMTR) GØ TØ 681                                        205600
    WRITE(6,222)                                                      205610
751 CØNTINUE                                                          205620
    IF (NLINK.EQ.0) GØ TØ 3108                                        205630
    DØ 602 NRIG=1,NLINK                                               205640
    READ(5,603) JD,JI,CØTAN,DUM                                       205650
603 FØRMAT(2I2,E14.7,T1,20A4)                                         205660
    WRITE(6,2001) DUM                                                 205670
    LST(NRIG) = JD                                                    205680
    IF (NRIG.EQ.1) GØ TØ 605                                          205690
    IF (JDD.LT.JD) GØ TØ 605                                          205700
    NERRØR = 31                                                       205710
    CALL ETRAP                                                        205720
    IF (JDD.GE.JD) GØ TØ 602                                          205730
605 JDD = JD                                                          205740
602 CØNTINUE                                                          205750
  5 READ(5,2000) DUM                                                  205760
    WRITE(6,2001) DUM                                                 205770
    IF (D.NE.DLIMTR) GØ TØ 5                                          205780
    WRITE(6,222)                                                      205790
3108 CØNTINUE                                                         205800
    DØ 109 J=1,NØJ                                                    205810
    READ(5,110) JN,DLP,ANGLE,DUM                                      205820
110 FØRMAT(I2,4F2.0,E14.1,T1,20A4)                                    205830
    WRITE(6,2001) DUM                                                 205840
    IF (NLINK.EQ.0) GØ TØ 109                                         205850
    DØ 130 N=1,NLINK                                                  205860
    IF (JN.EQ.LST(N)) GØ TØ 132                                       205870
130 CØNTINUE                                                          205880
    GØ TØ 109                                                         205890
132 DØ 131 I=1,4                                                      205900
    IF (DLP(I).EQ.0.0) GØ TØ 131                                      205910
    NERRØR = 34                                                       205920
    CALL ETRAP                                                        205930
    GØ TØ 109                                                         205940
131 CØNTINUE                                                          205950
109 CØNTINUE                                                          205960
  6 READ(5,2000) DUM                                                  205970
    WRITE(6,2001) DUM                                                 205980
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      IF (D.NE.DLIMTR) GØ TØ 6                                          205990
      WRITE(6,222)                                                      206000
      IF (KBC.NE.0) GØ TØ 303                                           206010
      READ(5,302) LINLØD,DUM                                            206020
  302 FØRMAT(I4,T1,20A4)                                                206030
      WRITE(6,2001) DUM                                                 206040
      IF (LINLØD.EQ.0) GØ TØ 7                                          206050
      DØ 304 N=1,LINLØD                                                 206060
      READ(5,305) JEXT2,JEXT1,XFL,DUM                                   206070
  305 FØRMAT(2I5,E14.7,T1,20A4)                                         206080
      WRITE(6,2001) DUM                                                 206090
  304 CØNTINUE                                                          206100
    7 READ(5,2000) DUM                                                  206110
      WRITE(6,2001) DUM                                                 206120
      IF (D.NE.DLIMTR) GØ TØ 7                                          206130
      WRITE(6,222)                                                      206140
  303 CØNTINUE                                                          206150
      LNBC = JNBC-1                                                     206160
      IF (LNBC.EQ.0) GØ TØ 888                                          206170
      DØ 320 I=1,LNBC                                                   206180
      DØ 310 J=1,NØJ                                                    206190
      READ(5,110) JN,DLP,ANGLE,DUM                                      206200
      WRITE(6,2001) DUM                                                 206210
      IF (NLINK.EQ.0) GØ TØ 310
      DØ 312 N=1,NLINK
      IF (JN.EQ.LST(N)) GØ TØ 313
  312 CØNTINUE
      GØ TØ 310
  313 DØ 314 N=1,4
      IF (DLP(N).EQ.0.0) GØ TØ 314
      NERRØR = 34
      CALL ETRAP
      GØ TØ 310
  314 CØNTINUE
  310 CØNTINUE                                                          206220
    8 READ(5,2000) DUM                                                  206230
      WRITE(6,2001) DUM                                                 206240
      IF (D.NE.DLIMTR) GØ TØ 8                                          206250
      WRITE(6,222)                                                      206260
  320 CØNTINUE                                                          206270
  888 IF (ICØUNT.EQ.0) GØ TØ 889                                        206280
      WRITE(6,866) ICØUNT                                               206290
  866 FØRMAT(10(/),100X,I5,- ERRØRS LØCATED.-)                          206300
      GØ TØ 1                                                           206310
  889 WRITE(6,865)                                                      206320
  865 FØRMAT(10(/),100X,-NØ DETECTABLE ERRØRS FØUND.-)                  206330
      GØ TØ 1                                                           206340
  555 CALL ENDJØB
      STØP                                                              206360
      END                                                               206370
 FØR,IS GRAPH,GRAPH
C ..... RØUTINE ** GRAPH  ** ABACUS UPDATED 07/21/72 .....             300000
      SUBRØUTINE GRAPH (NCHK,NRC)                                       300010
      CØMMØN/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),              300020
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,  300030
     2JJT(30),IJT(30)                                                   300040
      CØMMØN/GPLØT/ZZ(600),RRAD(600),NPT,NZR                            300050
      CØMMØN /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,       300060
     1                ,PØLY(10),NCØEF                                  300070
      CØMMØN NERRØR                                                     300080
      DIMENSIØN PHI(20),RAD(20),Z(20)
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      DIMENSIØN IDARY(2)
      DIMENSIØN R(3),ZE(9)                                          300100
      DATA IDARY/-HARDC0-,-PY     -/
      DATA AAA/-A    -/                                             300110
      DØ 600 I=1,20                                                 300120
      RAD(I) = 0.0                                                  300130
  600 Z(I) = 0.0                                                    300140
      IF(ISEG .NE.1)GØ TØ 20                                        300150
      NPT=0                                                         300160
      RELØR = 0.0                                                   300170
      IF(IREGC .NE.1)GØ TØ 20                                       300180
      CALL IDENT (9,IDARY)
      IREGC = 2                                                     300200
   20 IF (NCHK.EQ.1) GØ TØ 999                                      300210
      MG = MGEØM(ISEG)                                              300220
      GØ TØ (30,30,80,70,30,30,160,999),MG                          300230
   30 CØNTINUE                                                      300240
      DELTA=(STP(ISEG)-STIC(ISEG))/19.0                             300250
      DØ 50 I = 1,19                                                300260
      PHI(I)= (I-1)*DELTA + STIC(ISEG)                              300270
   50 CØNTINUE                                                      300280
      PHI(20)= STP(ISEG)                                            300290
   60 GØ TØ(100,90,80,70,130,120,160),MG                            300300
C                                                                   300310
C     CYLINDER                                                      300320
C                                                                   300330
   70 CØNTINUE                                                      300340
      NUMPT= 2                                                      300350
      RAD(1) = G1(ISEG)                                             300360
      RAD(2) = RAD(1)                                               300370
      Z(1) = STP(ISEG)-STIC(ISEG)                                   300380
      Z(2)= 0.0                                                     300390
      GØ TØ 200                                                     300400
C                                                                   300410
C     CØNE                                                          300420
C                                                                   300430
   80 CØNTINUE                                                      300440
      PHIANG= G1(ISEG)                                              300450
      CØSP= CØS(PHIANG)                                             300460
      RAD(1)= STIC(ISEG)* CØSP                                      300470
      RAD(2)= STP(ISEG)*  CØSP                                      300480
      Z(1)= SIN(PHIANG)*(STP(ISEG)-STIC(ISEG))                      300490
      Z(2)= 0.0                                                     300500
      NUMPT = 2                                                     300510
      GØ TØ 200                                                     300520
C                                                                   300530
C     SGIVE                                                         300540
C                                                                   300550
   90 CØNTINUE                                                      300560
      CØSP= CØS(STP(ISEG))                                          300570
      DØ 95 I=1,20                                                  300580
      RAD(I)= (G1(ISEG)*SIN(PHI(I))) - G2(ISEG)                     300590
      Z(I)= G1(ISEG)*(CØS(PHI(I))-CØSP)                             300600
   95 CØNTINUE                                                      300610
      Z(20)= 0.0                                                    300620
      NUMPT =20                                                     300630
      GØ TØ 200                                                     300640
C                                                                   300650
C     ELIPSE-(G3 IS ØFFSET DISTANCE)                                300660
C                                                                   300670
  100 CØNTINUE                                                      300680
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      BB= G2(ISEG)                                                      300690
      C= G3(ISEG)                                                       300700
      A= G1(ISEG)                                                       300710
      B= G2(ISEG)* A                                                    300720
      DØ 109 I=1,20                                                     300730
      CØSP= CØS(PHI(I))                                                 300740
      SINP= SIN(PHI(I))                                                 300750
      RAD(I) = SINP*A/((SINP**2+BB**2*CØSP**2)**.5)-C                   300760
      Z(I) = B*SQRT(1.0-(RAD(I)+C)**2/A**2)                             300770
      IF (PHI(I).GT.1.5708.AND.PHI(I).LT.4.61239) Z(I) = -Z(I)          300780
  109 CØNTINUE                                                          300790
      DØ 107 I=1,20                                                     300800
  107 Z(I) = Z(I)-Z(20)                                                 300810
      NUMPT = 20                                                        300820
      GØ TØ 200                                                         300830
C                                                                       300840
C     GENERAL GEØMETRY                                                  300850
C                                                                       300860
  120 CØNTINUE                                                          300870
      CALL GEØMET                                                       300880
      DØ 450 K=1,20                                                     300920
      ARG = PHI(K)                                                      300930
      DØ 404 J=1,100                                                    300940
      PHØ = PSI(J)                                                      300950
      IF (ANG.EQ.AAA) IF (ARG-PHØ) 421,423,404                          300960
      IF (PHØ-ARG) 421,423,404                                          300970
  421 IF (J-1) 8502,8502,424                                            300980
  404 CØNTINUE                                                          300990
      GØ TØ 8503                                                        301000
  423 RAD(K) = RADR(J)                                                  301010
      GØ TØ 450                                                         301020
 8502 NERRØR = 56                                                       301030
      CALL ETRAP                                                        301040
      WRITE(6,989) NRC,ISEG                                             301050
  989 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,-    *- 301060
     1       ///)                                                       301070
      NCHK = 1                                                          301080
      GØ TØ 999                                                         301090
 8503 NERRØR = 57                                                       301100
      CALL ETRAP                                                        301110
      WRITE(6,989) NRC,ISEG                                             301120
      NCHK = 1                                                          301130
      GØ TØ 999                                                         301140
  424 SUB1 = ARG-PSI(J-1)                                               301150
      SUB2 = PSI(J)-PSI(J-1)                                            301160
      RAD(K) = RADR(J-1)+(RADR(J)-RADR(J-1))*SUB1/SUB2                  301170
  450 CØNTINUE                                                          301180
      RMAX = RI(1)                                                      301190
      RMIN = RI(1)                                                      301200
      DØ 365 K=2,NRZIN                                                  301210
      IF (RI(K).LT.RMIN) RMIN = RI(K)                                   301220
      IF (RI(K).GT.RMAX) RMAX = RI(K)                                   301230
  365 CØNTINUE                                                          301240
      DØ 401 J=1,20                                                     301250
      IF (RAD(J).LT.RMIN) RAD(J) = RMIN                                 301270
      IF (RAD(J).GT.RMAX) RAD(J) = RMAX                                 301280
  401 CØNTINUE                                                          301290
      P1 = 3.1415926/2.0                                                301310
      P3 = 3.0*P1                                                       301320
      DØ 449 J=1,20                                                     301330
      PHØ = PHI(J)                                                      301340
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      IF (PHØ.LT.P1.ØR.PHØ.GT.P3) GØ TØ 353                              301350
      AA = RI(1)                                                         301360
      III = 1                                                            301370
      C = AA                                                             301380
      I = III                                                            301390
      JJ = 1                                                             301400
      DØ 451 K=2,NRZIN                                                   301410
      IF (ANG.EQ.AAA) IF (RAD(J)-RI(K)) 350,360,452                      301420
      IF (RI(K)-RAD(J)) 350,360,452                                      301430
  350 C = RI(K)                                                          301440
      I = K                                                              301450
      JJ = I                                                             301460
  451 CØNTINUE                                                           301470
  452 D = RI(K)                                                          301480
      II = K                                                             301490
      JJJ = II                                                           301500
      IF (I.NE.1) GØ TØ 460                                              301510
      AA = RI(K+1)                                                       301520
      III = K+1                                                          301530
      R(1) = C                                                           301540
      R(2) = D                                                           301550
      R(3) = AA                                                          301560
      ZE(4) = ZI(I)                                                      301570
      ZE(5) = ZI(II)                                                     301580
      ZE(6) = ZI(III)                                                    301590
      GØ TØ 480                                                          301600
  460 CØNTINUE                                                           301610
      AA = RI(K-2)                                                       301620
      III = K-2                                                          301630
      R(1) = AA                                                          301640
      R(2) = C                                                           301650
      R(3) = D                                                           301660
      ZE(4) = ZI(III)                                                    301670
      ZE(5) = ZI(I)                                                      301680
      ZE(6) = ZI(II)                                                     301690
      GØ TØ 480                                                          301700
  353 AA = RI(NRZIN)                                                     301710
      III = NRZIN                                                        301720
      C = A                                                              301730
      I = III                                                            301740
      JJ = NRZIN                                                         301750
      L = NRZIN-1                                                        301760
      K = L                                                              301770
      DØ 453 M=1,L                                                       301780
      IF (ANG.EQ.AAA) IF (RAD(J)-RI(K)) 349,360,454                      301790
      IF (RI(K)-RAD(J)) 349,360,454                                      301800
  349 C = RI(K)                                                          301810
      I = K                                                              301820
      JJ = I                                                             301830
      K = K-1                                                            301840
  453 CØNTINUE                                                           301850
  454 D = RI(K)                                                          301860
      II = K                                                             301870
      JJJ = II                                                           301880
      IF (I.NE.NRZIN) GØ TØ 470                                          301890
      AA = RI(K-1)                                                       301900
      III = K-1                                                          301910
      R(1) = C                                                           301920
      R(2) = D                                                           301930
      R(3) = AA                                                          301940
      ZE(4) = ZI(I)                                                      301950
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      ZE(5) = ZI(II)                                                    301960
      ZE(6) = ZI(III)                                                   301970
      GØ TØ 480                                                         301980
  470 CØNTINUE                                                          301990
      AA = RI(K+2)                                                      302000
      III = K+2                                                         302010
      R(1) = AA                                                         302020
      R(2) = C                                                          302030
      R(3) = D                                                          302040
      ZE(4) = ZI(III)                                                   302050
      ZE(5) = ZI(I)                                                     302060
      ZE(6) = ZI(II)                                                    302070
  480 CØNTINUE                                                          302080
      ZE(1) = ZE(4)*ZE(4)                                               302090
      ZE(2) = ZE(5)*ZE(5)                                               302100
      ZE(3) = ZE(6)*ZE(6)                                               302110
      ZE(7) = 1.0                                                       302120
      ZE(8) = 1.0                                                       302130
      ZE(9) = 1.0                                                       302140
      IF (PHØ.GE.P1.AND.PHØ.LE.P3) GØ TØ 370                            302170
      ITMP = JJ                                                         302180
      JJ = JJJ                                                          302190
      JJJ = ITMP                                                        302200
  370 CØNTINUE                                                          302210
      CALL SIMQ (ZE,R)                                                  302220
      AA = R(1)                                                         302230
      BB = R(2)                                                         302240
      CC = R(3)                                                         302250
      DISC = BB*BB-4.0*AA*(CC-RAD(J))                                   302260
      IF (DISC.LT.0.0) GØ TØ 8777                                       302270
      Z1 = (-BB+SQRT(DISC))/(2.0*AA)                                    302280
      Z2 = (-BB-SQRT(DISC))/(2.0*AA)                                    302290
      IF (Z1.GE.ZI(JJ).AND.Z1.LE.ZI(JJJ)) Z(J) = Z1                     302320
      IF (Z2.GE.ZI(JJ).AND.Z2.LE.ZI(JJJ)) Z(J) = Z2                     302330
      GØ TØ 449                                                         302360
 8777 WRITE(6,8778) J                                                   302370
 8778 FØRMAT(//- FØR J =-,I3,- THE RØØTS ARE IMAGINARY-)                302380
      GØ TØ 449                                                         302390
  360 Z(J) = ZI(K)                                                      302400
  449 CØNTINUE                                                          302410
      NUMPT = 20                                                        302420
      GØ TØ 200                                                         302430
C                                                                       302440
C     MØDIFIED ELIPSE                                                   302450
C                                                                       302460
  130 CØNTINUE                                                          302470
      A = G2(ISEG)                                                      302480
      DØ 110 I=1,20                                                     302490
      CØSP = CØS(PHI(I))                                                302500
      SINP = SIN(PHI(I))                                                302510
      SINP1 = 1.0/(SINP+1.0)                                            302520
      RAD(I) = 2.0*A*SINP*SINP1                                         302530
  110 Z(I) = 2.0*A*CØSP*(2.0-SINP1)/(3.0*(SINP+1.0))                    302540
      DØ 111 I=1,20                                                     302550
  111 Z(I) = Z(I)-Z(20)                                                 302560
      NUMPT = 20                                                        302570
      GØ TØ 200                                                         302580
C                                                                       302590
C     DUMMY GEØMETRY                                                    302600
C                                                                       302610
  160 CØNTINUE                                                          302620
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  200 CONTINUE                                                          302630
      IF(ISEG .NE.1)GO TO 220                                           302660
      IF(JJT(I) .GT. IJT(1))GO TO 230                                   302670
      GO TO 250                                                         302680
  220 CALL KLINK(IRET,LNKNUM)                                           302690
      GO TO (230,250,230,250),IRET                                      302700
C                                                                       302710
C     CONNECTED AT ITH-JOINT                                            302720
C                                                                       302730
  230 CONTINUE                                                          302740
      Z1 = Z(1)                                                         302750
      DO 240 I=1,NUMPT                                                  302760
      Z(I) = Z(I) - Z1                                                  302770
  240 CONTINUE                                                          302780
      GO TO 270                                                         302800
C                                                                       302810
C     CONNECTED AT J-JOINT                                              302820
C                                                                       302830
  250 INDX= NUMPT/2                                                     302840
      DO 260 I=1,INDX                                                   302850
      K= NUMPT+1-I                                                      302860
      TEMPZ= Z(I)                                                       302870
      TEMPR= RAD(I)                                                     302880
      Z(I)= Z(K)                                                        302890
      RAD(I)=RAD(K)                                                     302900
      Z(K)= TEMPZ                                                       302910
      RAD(K)= TEMPR                                                     302920
  260 CONTINUE                                                          302930
C                                                                       302940
C     ADD LAST RELATIVE ORIGIN                                          302950
C                                                                       302960
  270 DO 280 I=1,NUMPT                                                  302970
      Z(I) = Z(I)+RELOR                                                 302980
  280 CONTINUE                                                          302990
      RELOR = Z(NUMPT)                                                  303010
      IF(ISEG .EQ.1)GO TO 300                                           303020
      GO TO (300,300,290,290),IRET                                      303030
C                                                                       303040
C     KINEMATIC LINK AT THIS JOINT-ADJUST Z-COORDINATE                  303050
C                                                                       303060
  290 DZ=(RAD(1)-RADOLD)* COTAN(ANGLNK(LNKNUM))                         303070
      DO 295 I=1,NUMPT                                                  303080
      Z(I)= Z(I) + DZ                                                   303090
  295 CONTINUE                                                          303100
      D = COTAN(ANGLNK(LNKNUM))                                         303110
  300 RADOLD=RAD(NUMPT)                                                 303130
      RELOR = Z(NUMPT)                                                  303140
      DO 310 I=1,NUMPT                                                  303150
      RRAD( I+NPT)= RAD(I)                                              303160
      ZZ(  I+NPT) = Z(I)                                                303170
  310 CONTINUE                                                          303180
      NPT=NPT+NUMPT                                                     303190
  999 RETURN                                                            303200
      END                                                               303210
 FOR,IS KLINK,KLINK
C ..... ROUTINE ** KLINK  ** ABACUS UPDATED 07/21/72 .....             400000
      SUBROUTINE KLINK(IRET,LNKNUM)                                     400010
      COMMON/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),              400020
     1IREGC,ISEG ,NSEG,MGEOM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,  400030
     2JJT(30),IJT(30)                                                   400040
      ISEGC = ISEG                                                      400050
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      IF(IJT(ISEGC).EQ. IJT(ISEGC-1).ØR.IJT(ISEGC).EQ.JJT(ISEGC-1))      400060
     1GØ TØ 10                                                           400070
      IF(JJT(ISEGC).NE. IJT(ISEGC-1).AND. JJT(ISEGC).NE.JJT(ISEGC-1))    400080
     1GØ TØ 30                                                           400090
C     CØNNECTED AT J-JØINT                                              400100
      IRET= 2                                                            400110
      GØ TØ 100                                                          400120
C     CØNNECTED AT I-TH JØINT                                           400130
   10 IRET= 1                                                            400140
      GØ TØ 100                                                          400150
C                                                                        400160
C     IS THERE A KINEMATIC LINK                                          400170
C                                                                        400180
   30 DØ 50 I=1,NLINK                                                    400190
      IF(IJT(ISEGC),EQ. JLINK(I))GØ TØ 40                                400200
      IF(JJT(ISEGC).NE. JLINK(I))GØ TØ 50                                400210
      IRET= 4                                                            400220
      GØ TØ 45                                                           400230
   40 IRET=3                                                             400240
   45 LNKNUM= I                                                          400250
      GØ TØ 100                                                          400260
   50 CØNTINUE                                                           400270
      WRITE(6,60)                                                        400280
   60 FØRMAT(/,1X,-***-ERRØR-UNCØNNECTED JØINT BETWEEN SEGMENTS- )       400290
      STØP                                                               400300
  100 RETURN                                                             400310
      END                                                                400320
 FØR,IS ZPLØT,ZPLØT
C ..... RØUTINE ** ZPLØT  ** ABACUS UPDATED 07/21/72 .....              500000
      SUBRØUTINE ZPLØT (JCLUE)
      CØMMØN/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,
     2JJT(30),IJT(30)
      CØMMØN /GPLØT/ ZZ(600),RRAD(600),NPT,NZR,DX
      DIMENSIØN YTITLE(12),XTITLE(12)
      DIMENSIØN TITLE(12)
      DIMENSIØN ALPHA(3)
      EXTERNAL TABL1V
      DATA YTITLE/-Z - AX-,-IS    -,10*6H      /
      DATA XTITLE/-RADIUS-,- ØF RE-,-VØLUTI-,-ØN    -,8*6H      /
      DATA TITLE/-     R-,-EGIØN -,-NUMBER-,-      -,-      -,-      -,
     1          -     -,- SEGME-,-NTS   -,-      -,-      -,- LINKS-/
      CALL CHSIZV (2,2)
      CALL RITSTV (13,19,TABL1V)
C
      DS = DX
      IF (JCLUE.EQ.1) GØ TØ 200
      YMIN = ZZ(1)
      YMAX = ZZ(1)
      XMIN = 0.0
      XMAX = RRAD(1)
      DØ 400 J=2,NPT
      IF (ZZ(J).LE.YMIN) YMIN = ZZ(J)
      IF (ZZ(J).GT.YMAX) YMAX = ZZ(J)
      IF (RRAD(J).GT.XMAX) XMAX = RRAD(J)
  400 CØNTINUE
      IF (DX.NE.0.0) GØ TØ 500
      DX = XMAX-XMIN
      DV = YMAX-YMIN
      IF (DV.LT.DX) DV = DX
      GØ TØ 600
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  500 DV = DX
  600 CONTINUE
      YDIF = (YMAX-YMIN)/2.0+YMIN
      YMIN = YDIF-DV/2.0
      YMAX = YDIF+DV/2.0
      XDIF = (XMAX-XMIN)/2.0+XMIN
      XMIN = XDIF-DV/2.0
      XMAX = XDIF+DV/2.0
      CALL SCRND (XMAX,XMIN,XMX,XMN)
      CALL SCRND (YMAX,YMIN,YMX,YMN)
      CALL QUIK3L (-1,XMN,XMX,YMN,YMX,1H*,XTITLE,YTITLE,-NPT,RRAD,ZZ)
  200 IF (JCLUE.EQ.1) CALL FRAMEV (2)
      ENCODE (801,ALPHA) NZR,NSEG,NLINK
  801 FORMAT(3I6)
      TITLE(4) = ALPHA(1)
      TITLE(7) = ALPHA(2)
      TITLE(11) = ALPHA(3)
      CALL RITE2V (46,1005,1023,90,1,72,1,TITLE,IERR)
      IF (JCLUE.EQ.0) GO TO 99
      CALL CHSIZV (9,9)
      CALL RITSTV (48,68,TABLIV)
      I = 100
      J = 900
      CALL RITE2V (I,J,1023,90,1,6,1,6HDUE TO,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,5,1,5HINPUT,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,5,1,5HERROR,IERR)
      IF (JCLUE.EQ.1) GO TO 100
      J = J-100
      CALL RITE2V (I,J,1023,90,1,11,1,11HTHE REST OF,IERR)
  100 J = J-100
      CALL RITE2V (I,J,1023,90,1,11,1,11HTHIS REGION,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,6,1,6HIS NOT,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,9,1,9HGRAPHABLE,IERR)
   99 CONTINUE
      DX = DS
      RETURN
      END
 FOR,IS GEOMET,GEOMET
C ..... ROUTINE ** GEOMET ** ABACUS UPDATED 07/21/72 .....                  600000
      SUBROUTINE GEOMET                                                     600010
C     THIS SUBROUTINE CALCULATES THE GEOMETRY FOR A SHELL SEGMENT.          600020
C     THE INPUT VARIABLES ARE . . .                                         600030
C             RI(I) - - DISTANCE FROM AXIS OF REV. TO POINTS                600040
C                       ON SHELL MERIDIAN.                                  600050
C             ZI(I) - - DISTANCE ALONG AXIS OF REV. TO THE                  600060
C                       INTERSECTION OF THE CORRESPONDING RI(I) AND         600070
C                       THE AXIS OF REV.                                    600080
C               NRZIN - - NUMBER OF (RI,ZI) PAIRS READ AS INPUT.            600090
C                                                                           600100
      COMMON /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,           600110
     1                POLY(10),NCOEF                                       600120
      DIMENSION CI(4,13),DRDZ(14),SOUT(14),S(101),RADD(100)                 600130
C                                                                           600140
      FUN(ARG) = SQRT(1.0 + ARG**2)                                         600150
C                                                                           600160
      RADS = 3.1415926/180.0                                                600170
      DATA B/-8   -/                                                        600180
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      AMULT = 1.0                                                       600190
      IF (ANG.EQ.B) AMULT = -1.0                                        600200
C                                                                       600210
C     PASS SPLINE CURVE THRØUGH INPUT PØINTS ØN SHELL MERIDIAN, AND     600220
C     CØMPUTE DR/DZ AT THESE PØINTS.                                    600230
C                                                                       600240
      CALL PLICØ (ZI,RI,NRZIN,CI)                                       600250
      NDELZ = NRZIN - 1                                                 600260
      DØ 60 I=1,NRZIN                                                   600270
      CALL PLINE (ZI,RI,NRZIN,CI,ZI(I),FAKE1,DRDZ(I),FAKE2)             600280
   60 CØNTINUE                                                          600290
C                                                                       600300
C     CØMPUTE MERIDIØNAL ARC LENGTH TØ INTERPØLATED PØINTS BY           600310
C     NUMERICAL INTEGRATIØN (SIMPSØNS RULE).  SINCE SIMPSØNS RULE       600320
C     REQUIRES AN EVEN NUMBER ØF PARTITIØNS, INTERPØLATE A PØINT        600330
C     MIDWAY BETWEEN EACH PAIR ØF PØINTS USING SUBRØUTINE SPLINE.       600340
C                                                                       600350
      SØUT(1) = 0.                                                      600360
      DØ 70 I=1,NDELZ                                                   600370
      DZ2=(ZI(I+1)-ZI(I))/2.0                                           600380
      DZ6=DZ2/3.0                                                       600390
      CALL PLINE (ZI,RI,NRZIN,CI,ZI(I)+DZ2,FAKE1,DRDZM,FAKE2)           600400
      SØUT(I+1) = SØUT(I) + DZ6*(FUN(DRDZ(I)) + 4.0*FUN(DRDZM) +        600410
     1            FUN(DRDZ(I+1)))                                       600420
   70 CØNTINUE                                                          600430
C                                                                       600440
C     USE SPLICØ TØ REPRESENT RI(I) AS A FUNCTIØN ØF SØUT(I).  THEN USE 600450
C     SPLINE TØ INTERPØLATE RADD.                                       600460
C                                                                       600470
      ØLDH1 = SØUT(NRZIN)/99.0                                          600480
  100 CALL PLICØ (SØUT,RI,NRZIN,CI)                                     600490
      DØ 110 I=1,100                                                    600500
      S(I) = FLØAT(I-1)*ØLDH1                                           600510
      CALL PLINE (SØUT,RI,NRZIN,CI,S(I),RADR(I),RADD(I),RADD2)          600520
      IF (ABS(RADD(I)).GT.1.0) RADD(I)=1.0                              600530
  110 CØNTINUE                                                          600540
      DØ 180 J=1,100                                                    600550
      CØSPSI = AMULT*RADD(J)                                            600560
      PSI(J) = ARCØS(CØSPSI)                                            600570
      IF (ANG.EQ.B) GØ TØ 180                                           600580
      PSI(J) = 2.0*3.1415926-PSI(J)                                     600590
  180 CØNTINUE                                                          600600
      RETURN                                                            600610
      END                                                               600620
 FØR,IS PLINE,PLINE
C ..... RØUTINE ** PLINE  ** ABACUS UPDATED 07/21/72 .....             700000
      SUBRØUTINE PLINE (X,Y,M,C,XINT,YINT,DYDX,D2YDX2)                  700010
C     SUBRØUTINE FØR SPLINE FIT INTERPØLATIØN IN THE TABLE ØF VALUES    700020
C     (X1,Y1) TØ (XM,YM), WHERE M MAY BE AS LARGE AS 100, WHERE THE     700030
C     CØNSTANTS C(1,K),C(2,K),C(3,K) AND C(4,K) ARE ALREADY CØMPUTED    700040
C     AND STØRED.                                                       700050
C     SUBRØUTINE ALSØ CØMPUTES DY/DX AND D2Y/DX2 AT XINT.               700060
      DIMENSIØN X(14),Y(14),C(4,13)                                     700070
      IF (XINT-X(1)) 80,10,20                                           700080
   10 YINT = Y(1)                                                       700090
      K=1                                                               700100
      GØ TØ 70                                                          700110
   20 K = 1                                                             700120
   30 IF (XINT-X(K+1)) 60,40,50                                         700130
   40 YINT = Y(K+1)                                                     700140
      GØ TØ 70                                                          700150
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   50 K = K + 1                                                          700160
      IF (M-K) 80,80,30                                                  700170
   60 YINT = (X(K+1) - XINT)*(C(1,K)*(X(K+1)-XINT)**2+C(3,K))            700180
      YINT = YINT + (XINT-X(K))*(C(2,K)*(XINT-X(K))**2+C(4,K))           700190
   70 DYDX=-3.0*(C(1,K)*(X(K+1)-XINT)**2-C(2,K)*(XINT-X(K))**2)          700200
     1    -C(3,K)+C(4,K)                                                700210
      D2YDX2=6.0*(C(1,K)*(X(K+1)-XINT)+C(2,K)*(XINT-X(K)))               700220
      RETURN                                                             700230
   80 WRITE (6,90)                                                       700240
   90 FØRMAT (31H ØUT ØF RANGE FØR INTERPØLATIØN)                        700250
      RETURN                                                             700260
      END                                                                700270
 FØR,IS PLICØ,PLICØ
C ..... RØUTINE ** PLICØ  ** ABACUS UPDATED 07/21/72 .....              800000
      SUBRØUTINE PLICØ (X,Y,M,C)                                         800010
C     SUBRØUTINE TØ DETERMINE C(1,K),C(2,K),C(3,K) AND C(4,K).           800020
      DIMENSIØN X(14),Y(14),A(14,3),B(14),Z(14)                          800030
      DIMENSIØN D(13),P(13),E(13),C(4,13)                                800040
      MM = M-1                                                           800050
      DØ 10 K=1,MM                                                       800060
      D(K) = X(K+1) - X(K)                                               800070
      P(K) = D(K)/6.0                                                    800080
   10 E(K) = (Y(K+1)-Y(K))/D(K)                                          800090
      DØ 20 K=2,MM                                                       800100
   20 B(K) = E(K) - E(K-1)                                               800110
      A(1,2) = -1.0-D(1)/D(2)                                            800120
      A(1,3) = D(1)/D(2)                                                 800130
      A(2,3) = P(2)-P(1)*A(1,3)                                          800140
      A(2,2) = 2.0*(P(1)+P(2)) - P(1)*A(1,2)                             800150
      A(2,3) = A(2,3)/A(2,2)                                             800160
      B(2) = B(2)/A(2,2)                                                 800170
      DØ 30 K=3,MM                                                       800180
      A(K,2) = 2.0*(P(K-1)+P(K))-P(K-1)*A(K-1,3)                         800190
      B(K) = B(K)-P(K-1)*B(K-1)                                          800200
      A(K,3) = P(K)/A(K,2)                                               800210
   30 B(K) = B(K)/A(K,2)                                                 800220
      Q = D(M-2)/D(M-1)                                                  800230
      A(M,1) = 1.0+Q+A(M-2,3)                                            800240
      A(M,2) = -Q-A(M,1)*A(M-1,3)                                        800250
      B(M) = B(M-2)-A(M,1)*B(M-1)                                        800260
      Z(M) = B(M)/A(M,2)                                                 800270
      MN = M-2                                                           800280
      DØ 40 I=1,MN                                                       800290
      K = M-I                                                            800300
   40 Z(K) = B(K)-A(K,3)*Z(K+1)                                          800310
      Z(1) = -A(1,2)*Z(2)-A(1,3)*Z(3)                                    800320
      DØ 50 K=1,MM                                                       800330
      Q = 1.0/(6.0*D(K))                                                 800340
      C(1,K) = Z(K)*Q                                                    800350
      C(2,K) = Z(K+1)*Q                                                  800360
      C(3,K) = Y(K)/D(K)-Z(K)*P(K)                                       800370
   50 C(4,K) = Y(K+1)/D(K)-Z(K+1)*P(K)                                   800380
      RETURN                                                             800390
      END                                                                800400
 FØR,IS SIMQ,SIMQ
C ..... RØUTINE **  SIMQ  ** ABACUS UPDATED 07/21/72 .....              900000
      SUBRØUTINE SIMQ (A,B)                                              900010
      DIMENSIØN A(1),B(1)                                                900020
C                                                                        900030
C     FØRWARD SØLUTIØN                                                   900040
C                                                                        900050
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```
      N = 3                                                          900060
      TØL = 0.0                                                      900070
      KS = 0                                                         900080
      JJ = -N                                                        900090
      DØ 65 J=I,N                                                    900100
      JY = J+1                                                       900110
      JJ = JJ+N+1                                                    900120
      BIGA = 0.0                                                     900130
      IT = JJ-J                                                      900140
      DØ 30 I=J,N                                                    900150
C                                                                    900160
C     SEARCH FØR MAXIMUM CØEFFICIENT IN CØLUMN                       900170
C                                                                    900180
      IJ = IT+I                                                      900190
      IF (ABS(BIGA)-ABS(A(IJ))) 20,30,30                             900200
   20 BIGA = A(IJ)                                                   900210
      IMAX = I                                                       900220
   30 CØNTINUE                                                       900230
C                                                                    900240
C     TEST FØR PIVØT LESS THAN TØLERANCE (SINGULAR MATRIX)           900250
C                                                                    900260
      IF (ABS(BIGA)-TØL) 35,35,40                                    900270
   35 KS = 1                                                         900280
      RETURN                                                         900290
C                                                                    900300
C     INTERCHANGE RØWS IF NECESSARY                                  900310
C                                                                    900320
   40 I1 = J+N*(J-2)                                                 900330
      IT = IMAX-J                                                    900340
      DØ 50 K=J,N                                                    900350
      I1 = I1+N                                                      900360
      I2 = I1+IT                                                     900370
      SAVE = A(I1)                                                   900380
      A(I1) = A(I2)                                                  900390
      A(I2) = SAVE                                                   900400
C                                                                    900410
C     DIVIDE EQUATIØN BY LEADING CØEFFICIENT                         900420
C                                                                    900430
   50 A(I1) = A(I1)/BIGA                                             900440
      SAVE = B(IMAX)                                                 900450
      B(IMAX) = B(J)                                                 900460
      B(J) = SAVE/BIGA                                               900470
C                                                                    900480
C     ELIMINATE NEXT VARIABLE                                        900490
C                                                                    900500
      IF (J-N) 55,70,55                                              900510
   55 IQS = N*(J-1)                                                  900520
      DØ 65 IX=JY,N                                                  900530
      IXJ = IQS+IX                                                   900540
      IT = J-IX                                                      900550
      DØ 60 JX=JY,N                                                  900560
      IXJX = N*(JX-1)+IX                                             900570
      JJX = IXJX+IT                                                  900580
   60 A(IXJX) = A(IXJX)-(A(IXJ)*A(JJX))                              900590
   65 B(IX) = B(IX)-(B(J)*A(IXJ))                                    900600
C                                                                    900610
C     BACK SØLUTIØN                                                  900620
C                                                                    900630
   70 NY = N-1                                                       900640
      IT = N*N                                                       900650
      DØ 80 J=1,NY                                                   900660
```

```
      IA = IT-J                                                          900670
      IB = N-J                                                           900680
      IC = N                                                             900690
      DØ 80 K=1,J                                                        900700
      B(IB) = B(IB)-A(IA)*B(IC)                                          900710
      IA = IA-N                                                          900720
   80 IC = IC-1                                                          900730
      RETURN                                                             900740
      END                                                                900750
 FØR,IS ETRAP,ETRAP
C ..... RØUTINE ** ETRAP  ** ABACUS UPDATED 07/21/72 .....              1000000
      SUBRØUTINE ETRAP                                                   1000010
      CØMMØN NERRØR,ICØUNT                                               1000020
      ICØUNT = ICØUNT+1                                                  1000030
      GØ TØ (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,   1000040
     1       23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39),NERRØR  1000050
    1 WRITE(6,101)                                                       1000060
  101 FØRMAT(/  4X,-ØNE ØF THE MATERIAL PRØPERTY TABLES CANNØT BE IDENTI 1000070
     1FIED AS ISØT, ØRTH, ØR STIF.-/)                                    1000080
      GØ TØ 99                                                           1000090
    2 WRITE(6,102)                                                       1000100
  102 FØRMAT(/  4X,-THE TYPE ØF GEØMETRY ØF A SEGMENT CANNØT BE IDENTIFI 1000110
     1ED AS ØNE HANDLED BY THE PRØGRAM.-/)                               1000120
      GØ TØ 99                                                           1000130
    3 WRITE(6,103)                                                       1000140
  103 FØRMAT(/  4X,-THE NUMBER ØF PØINTS IN THE ST TABLE MUST BE BETWEEN 1000150
     1 2 AND 30.-/)                                                      1000160
      GØ TØ 99                                                           1000170
    4 WRITE(6,104)                                                       1000180
  104 FØRMAT(/  4X,-A MATERIAL PRØPERTY TABLE NAME FØR A SEGMENT CANNØT  1000190
     1BE FØUND IN THE TABLE LIST.-/)                                     1000200
      GØ TØ 99                                                           1000210
    5 WRITE(6,105)                                                       1000220
  105 FØRMAT(/  4X,-THE TYPE ØF MATERIAL PRØPERTY TABLE FØR A SEGMENT CA 1000230
     1NNØT BE IDENTIFIED AS ISØT, ØRTH, ØR STIF.-/)                      1000240
      GØ TØ 99                                                           1000250
    6 WRITE(6,106)                                                       1000260
  106 FØRMAT(/  4X,-THE PRØBLEM INPUT CAN ØNLY BE THIC, RWAF, RWA1, RWA2 1000270
     1, RWA3, ST10, ST11, ST12, ST13, ISG1, ISG2, ØR ISG3.-/)            1000280
      GØ TØ 99                                                           1000290
    7 WRITE(6,107)                                                       1000300
  107 FØRMAT(/  4X,-THE WALL CØNSTRUCTIØN ØF A SEGMENT CANNØT BE IDENTIF 1000310
     1IED AS SING, EQUA, UNEQ, ØR BLAN.-/)                               1000320
      GØ TØ 99                                                           1000330
    8 WRITE(6,108)                                                       1000340
  108 FØRMAT(/  4X,-THE TYPE ØF TEMPERATURE INPUT FØR A SEGMENT CANNØT B 1000350
     1E IDENTIFIED AS THST, NØTH, THCN, ØR THIN.-/)                      1000360
      GØ TØ 99                                                           1000370
    9 WRITE(6,109)                                                       1000380
  109 FØRMAT(/  4X,-THE WAFFLE GRID SPACING IS ZERØ.-/)                  1000390
      GØ TØ 99                                                           1000400
   10 WRITE(6,110)                                                       1000410
  110 FØRMAT(/  4X,-THE RING SPACING IS ZERØ.-/)                         1000420
      GØ TØ 99                                                           1000430
   11 WRITE(6,111)                                                       1000440
  111 FØRMAT(/  4X,-THE STRINGER SPACING IS ZERØ.-/)                     1000450
      GØ TØ 99                                                           1000460
   12 WRITE(6,112)                                                       1000470
  112 FØRMAT(/  4X,-THE ØUTSIDE SHEET THICKNESS IS ZERØ.-/)              1000480
      GØ TØ 99                                                           1000490
   13 WRITE(6,113)                                                       1000500
```

```
113 FØRMAT(/  4X,-THE CØRE THICKNESS IS ZERØ.-/)                          1000510
    GØ TØ 99                                                             1000520
 14 WRITE(6,114)                                                         1000530
114 FØRMAT(/  4X,-THE SHEET THICKNESS IS ZERØ.-/)                        1000540
    GØ TØ 99                                                             1000550
 15 WRITE(6,115)                                                         1000560
115 FØRMAT(/  4X,-THE INSIDE SHEET THICKNESS IS ZERØ.-/)                 1000570
    GØ TØ 99                                                             1000580
 16 WRITE(6,116)                                                         1000590
116 FØRMAT(/  4X,-THE K11 STIFFNESS PARAMETER IS ZERØ.-/)                1000600
    GØ TØ 99                                                             1000610
 17 WRITE(6,117)                                                         1000620
117 FØRMAT(/  4X,-THE K12 STIFFNESS PARAMETER IS ZERØ.-/)                1000630
    GØ TØ 99                                                             1000640
 18 WRITE(6,118)                                                         1000650
118 FØRMAT(/  4X,-THE K21 STIFFNESS PARAMETER IS ZERØ.-/)                1000660
    GØ TØ 99                                                             1000670
 19 WRITE(6,119)                                                         1000680
119 FØRMAT(/  4X,-THE K22 STIFFNESS PARAMETER IS ZERØ.-/)                1000690
    GØ TØ 99                                                             1000700
 20 WRITE(6,120)                                                         1000710
120 FØRMAT(/  4X,-THE K33 STIFFNESS PARAMETER IS ZERØ.-/)                1000720
    GØ TØ 99                                                             1000730
 21 WRITE(6,121)                                                         1000740
121 FØRMAT(/  4X,-THE D11 STIFFNESS PARAMETER IS ZERØ.-/)                1000750
    GØ TØ 99                                                             1000760
 22 WRITE(6,122)                                                         1000770
122 FØRMAT(/  4X,-THE D12 STIFFNESS PARAMETER IS ZERØ.-/)                1000780
    GØ TØ 99                                                             1000790
 23 WRITE(6,123)                                                         1000800
123 FØRMAT(/  4X,-THE D21 STIFFNESS PARAMETER IS ZERØ.-/)                1000810
    GØ TØ 99                                                             1000820
 24 WRITE(6,124)                                                         1000830
124 FØRMAT(/  4X,-THE D22 STIFFNESS PARAMETER IS ZERØ.-/)                1000840
    GØ TØ 99                                                             1000850
 25 WRITE(6,125)                                                         1000860
125 FØRMAT(/  4X,-THE D33 STIFFNESS PARAMETER IS ZERØ.-/)                1000870
    GØ TØ 99                                                             1000880
 26 WRITE(6,126)                                                         1000890
126 FØRMAT(/  4X,-TEMPERATURE CAN ØNLY BE CØNSIDERED IN EITHER THE PRE   1000900
   1BUCKLING STATE ØR AS PART ØF THE BUCKLING LØAD.-/)                   1000910
    GØ TØ 99                                                             1000920
 27 WRITE(6,127)                                                         1000930
127 FØRMAT(/  4X,-THE LØAD INDICATØR CLUES CAN ØNLY BE ZERØ, BLANK, ØN   1000940
   1E, ØR FØUR.-/)                                                       1000950
    GØ TØ 99                                                             1000960
 28 WRITE(6,128)                                                         1000970
128 FØRMAT(/  4X,-THE INTERPØLATED VALUE ØF TEMPERATURE FØR USE IN THE   1000980
   1 MATERIAL PRØPERTY TABLE IS LESS THAN THE SECØND TEMPERATURE VALUE   1000990
   2.-/)                                                                 1001000
    GØ TØ 99                                                             1001010
 29 WRITE(6,129)                                                         1001020
129 FØRMAT(/  4X,-THE INTERPØLATED VALUE ØF TEMPERATURE FØR USE IN THE   1001030
   1 MATERIAL PRØPERTY TABLE IS GREATER THAN THE LAST VALUE ØF TEMPERA   1001040
   2TURE.-/)                                                             1001050
    GØ TØ 99                                                             1001060
 30 WRITE(6,130)                                                         1001070
130 FØRMAT(/  4X,-FØR KINEMATIC LINKS BETWEEN SEGMENTS, THE DEPENDENT    1001080
   1JØINT NUMBER MUST BE GREATER THAN THE INDEPENDENT JØINT NUMBER.-/)    1001090
    GØ TØ 99                                                             1001100
 31 WRITE(6,131)                                                         1001110
```

```
  131 FØRMAT(/  4X,-J-TH JØINTS ØN SUCCESSIVE INTER-REGIØN KINEMATIC LIN 1001120
     1K CARDS MUST BE IN INCREASING ØRDER.-/)                             1001130
       GØ TØ 99                                                           1001140
   32 WRITE(6,132)                                                        1001150
  132 FØRMAT(/  4X,-TEMPERATURE VALUES (CØLUMNS 2 THRU END) IN THE MATER 1001160
     1IAL PRØPERTY TABLE MUST BE IN INCREASING ØRDER.-/)                  1001170
       GØ TØ 99                                                           1001180
   33 WRITE(6,133)                                                        1001190
  133 FØRMAT(/  4X,-FØR AN ANNULAR PLATE NEAR THE AXIS ØF REVØLUTIØN, TH 1001200
     1E END PØINT LØCATIØNS SHØULD BE IN A RATIØ BETWEEN .01 AND 100.-/) 1001210
       GØ TØ 99                                                           1001220
   34 WRITE(6,134)                                                        1001230
  134 FØRMAT(/  4X,-DEGREES ØF FREEDØM ØF DEPENDENT (J) JØINT ØF KINEMAT 1001240
     1IC LINKS MUST BE --ZERØED ØUT--.-/)                                 1001250
       GØ TØ 99                                                           1001260
   35 WRITE(6,135)                                                        1001270
  135 FØRMAT(/  4X,-TEMPERATURE AND LØAD CLUES ARE INCØNSISTENT.-/)       1001280
   36 GØ TØ 99
   37 WRITE(6,137)                                                        1001340
  137 FØRMAT(/  4X,-THE NUMBER ØF REGIØN RINGS EXCEEDS 28.-/)             1001350
       GØ TØ 99                                                           1001360
   38 WRITE(6,138)                                                        1001370
  138 FØRMAT(/  4X,-THE NUMBER ØF STRUCTURE RINGS EXCEEDS 28.-/)          1001380
       GØ TØ 99                                                           1001390
   39 WRITE(6,139)                                                        1001400
  139 FØRMAT(/  4X,-THE NUMBER ØF GEØMETRY INPUT PØINTS EXCEEDS 14.-/)    1001410
   99 RETURN                                                              1001420
        END                                                               1001430
MAP,IS SYM,STARSS
LIB SYS$*MSFC$.
CØPØUT TPF$.,PUR.
XQT STARSS
```

SECTION 4

SATELLITE-1V PROGRAM

The discussions in SECTION 1 for items 1.1, 1.2 are equally valid for all SAT-1( ) programs.

EXAMPLES, FLOW CHARTS, LISTING: One sample test problem is executed by the SAT-1V program. Since most of the errors have been previously discussed, the current problem exemplifies a successful submission.

SATELLITE-1V

STARS-2V (VIBRATION) DATA DEBUGGING PROGRAM

VERSION DATE NOVEMBER 1, 1972

FOR INFORMATION CALL V. SVALBONAS
(516) 575-7701
P. OGILVIE

```
   FREE  VIBRATIONS - CONE
 8  8 1 1 2 1 0 1    1 0                                  29053.4
FREV
                                                NOTE - BASIC EIGENVALUE CALCULATIONS WILL BE PERFORMED BY HOUSEHOLDER METHOD.

STEL       ISOT
    .0000000        .0000000        .0000000        .0000000        .0000000
    .0000000        .0000000        .0000000        .0000000        .0000000
    .3000000+08     .0000000        .0000000        .0000000        .0000000
    .0000000        .0000000        .0000000        .0000000        .0000000
    .3000000+00     .0000000        .0000000        .0000000        .0000000
    .0000000        .0000000        .0000000        .0000000        .0000000
    .0000000        .0000000        .0000000        .0000000        .0000000
    .0000000        .0000000        .0000000        .0000000        .0000000
-------------------------------------------------------------------------------

 1 0 0  REGION 1
    1    1    2
21 CONE
   .09          1.0       E-04    .009                                  0.
  1.22173
 ISOT       STEL       SING       THIC       NOTH       0.0                  2
    .6227706+01    .7127706+01
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
    1    1    2
-------------------------------------------------------------------------------

 1 0 0  REGION 2
    2    2    3
21 CONE
   .09          1.0       E-04    .009                                  0.
  1.22173
 ISOT       STEL       SING       THIC       NOTH       0.0                  2
    .7127706+01    .8027706+01
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
    1    1    2
-------------------------------------------------------------------------------

 1 0 0  REGION 3
    3    3    4
21 CONE
   .09          1.0       E-04    .009                                  0.
  1.22173
 ISOT       STEL       SING       THIC       NOTH       0.0                  2
    .8027706+01    .8927706+01
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
    1    1    2
-------------------------------------------------------------------------------
```

```
 1 0 0  REGION 4
    4    4    5
21 CONE
   .1            1.0       E-04    .01                                    0.
 1.22173
ISOT       STEL        SING        THIC       NOTH        0.0             2
    .8927706+01    .9927706+01
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
     1    1    2
------------------------------------------------------------------------------


 1 0 0  REGION 5
    5    5    6
21 CONE
   .1            1.0       E-04    .01                                    0.
 1.22173
ISOT       STEL        SING        THIC       NOTH        0.0             2
    .9927706+01    .1092771+02
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
     1    1    2
------------------------------------------------------------------------------


 1 0 0  REGION 6
    6    6    7
21 CONE
   .11           1.0       E-04    .011                                   0.
 1.22173
ISOT       STEL        SING        THIC       NOTH        0.0             2
    .1092771+02    .1202771+02
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
     1    1    2
------------------------------------------------------------------------------

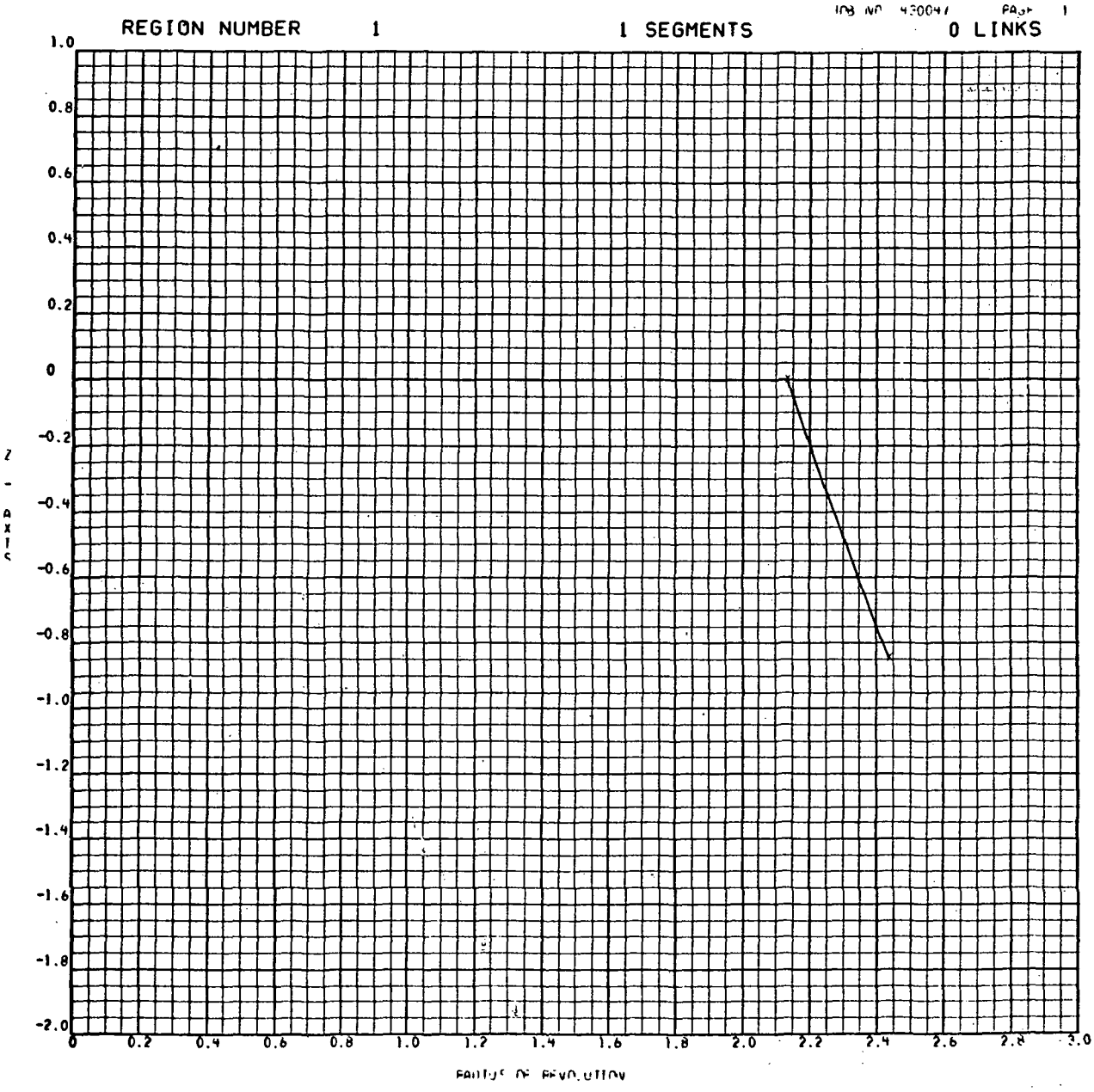

 1 0 0  REGION 7
    7    7    8
21 CONE
   .11           1.0       E-04    .011                                   0.
 1.22173
ISOT       STEL        SING        THIC       NOTH        0.0             2
    .1202771+02    .1312771+02
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
     1    1    2
------------------------------------------------------------------------------

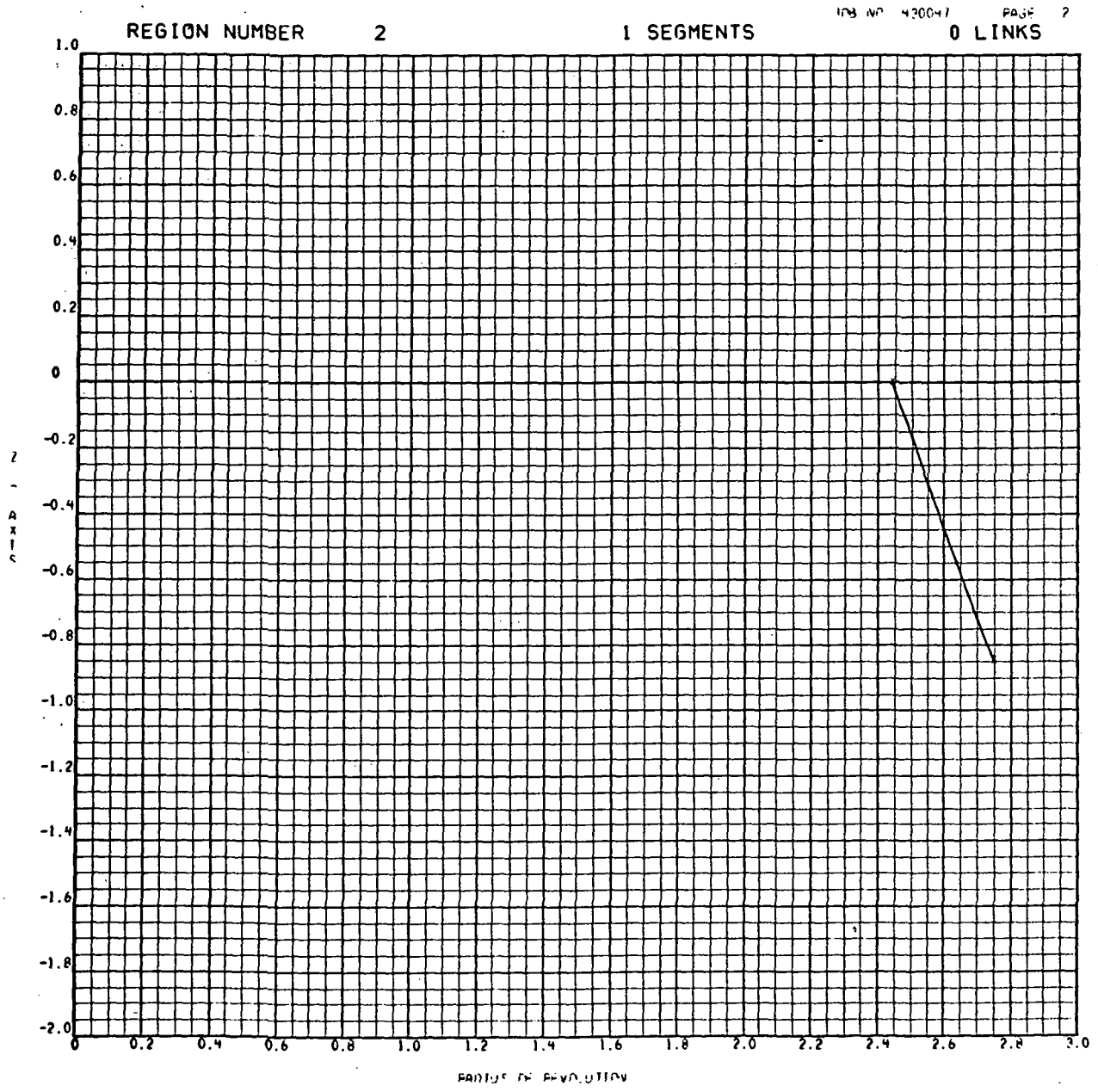

 1 0 0  REGION 8
    8    8    9
```

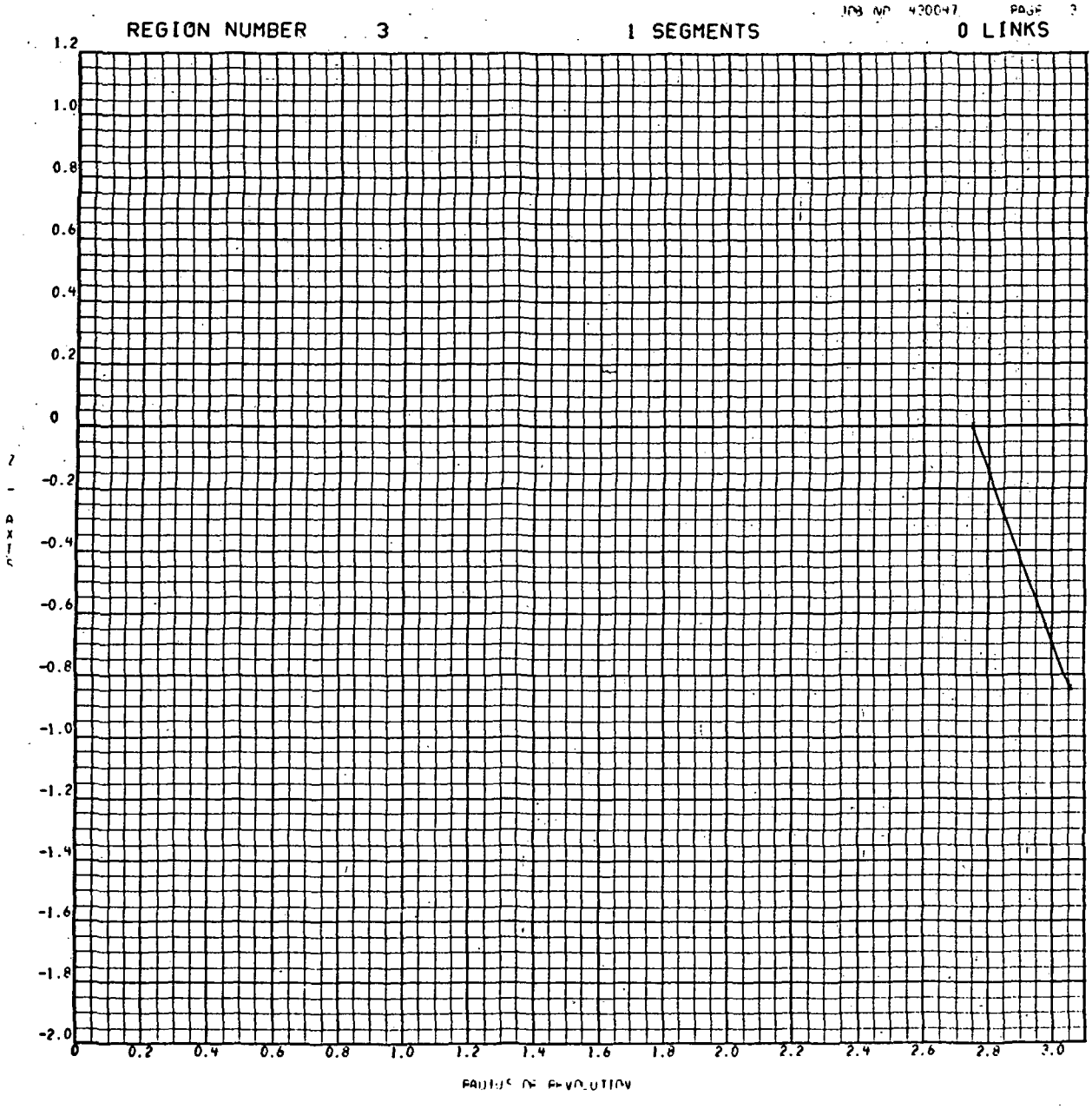
```
21 CONE
  .11          1.0      E-04   .011                                    0.
  1.22173
ISOT      STEL      SING      THIC      NOTH      0.0                  2
    .1312771+02    .1492771+02
    .4000000-01    .4000000-01
    .7760000-03    .7760000-03
     1     1     2
------------------------------------------------------------------------

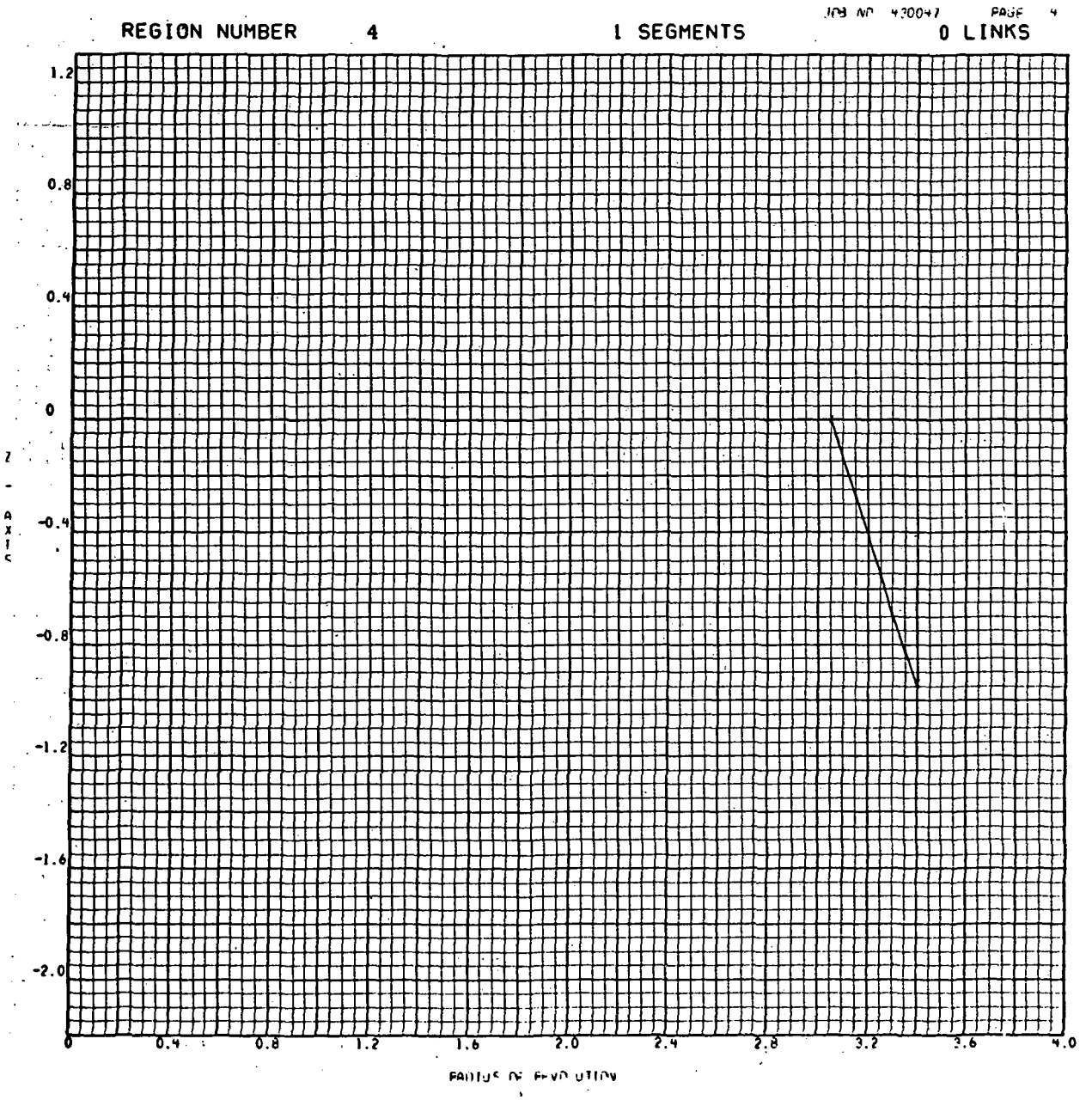
     9     0     0
  1 0 2 0 1 1.22173
  2 1 1 1 1
  3 1 1 1 1
  4 1 1 1 1
  5 1 1 1 1
  6 1 1 1 1
  7 1 1 1 1
  8 1 1 1 1
  9 0 2 0 1 1.22173
------------------------------------------------------------------------
```


NO DETECTABLE ERRORS FOUND.

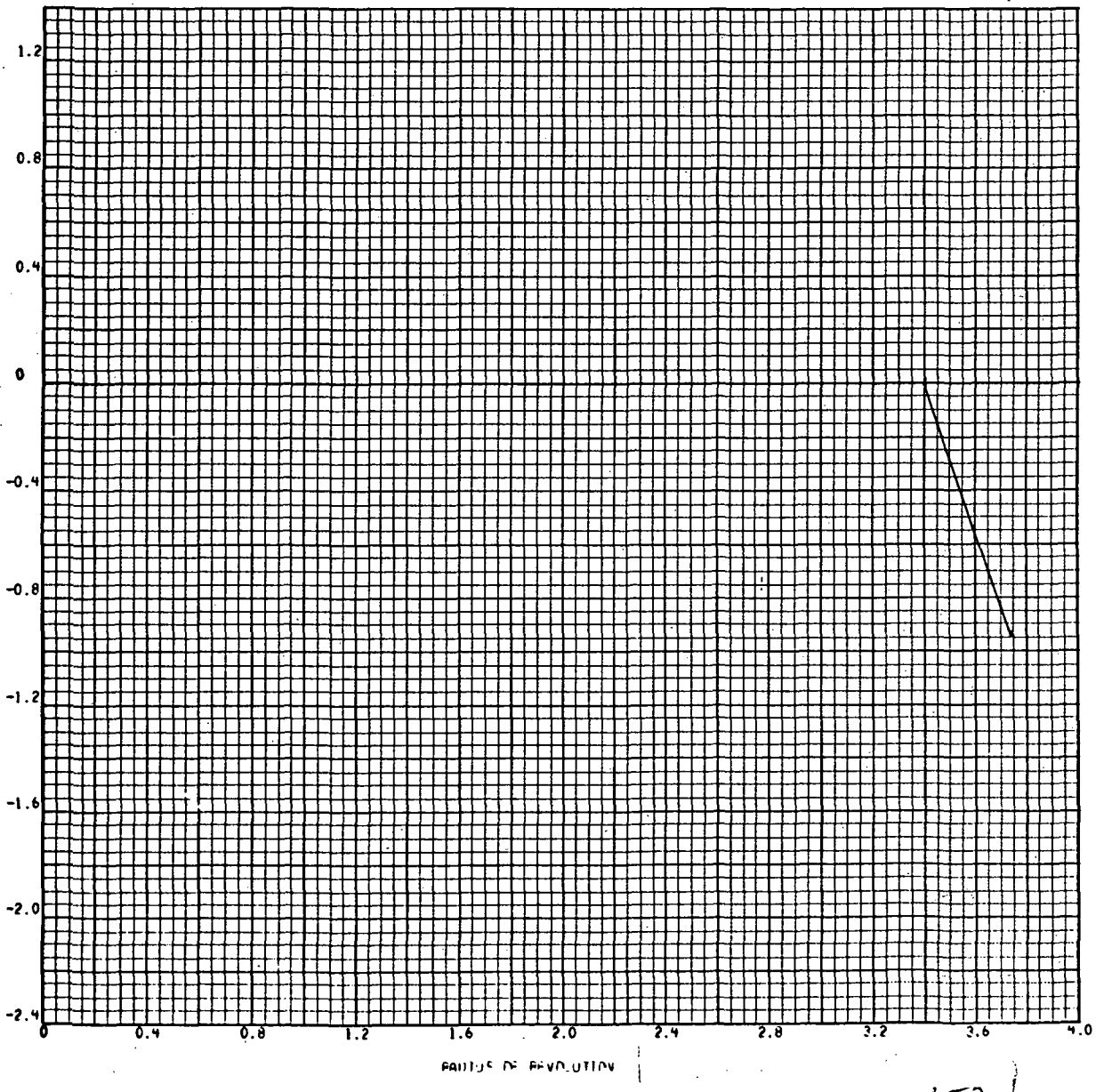

REGION NUMBER 1
1 SEGMENTS
0 LINKS
1.0
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
Z - AXIS


JOB NO 430047 PAGE 2
REGION NUMBER 2
1 SEGMENTS
0 LINKS
1.0
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
RADIUS OF REVOLUTION

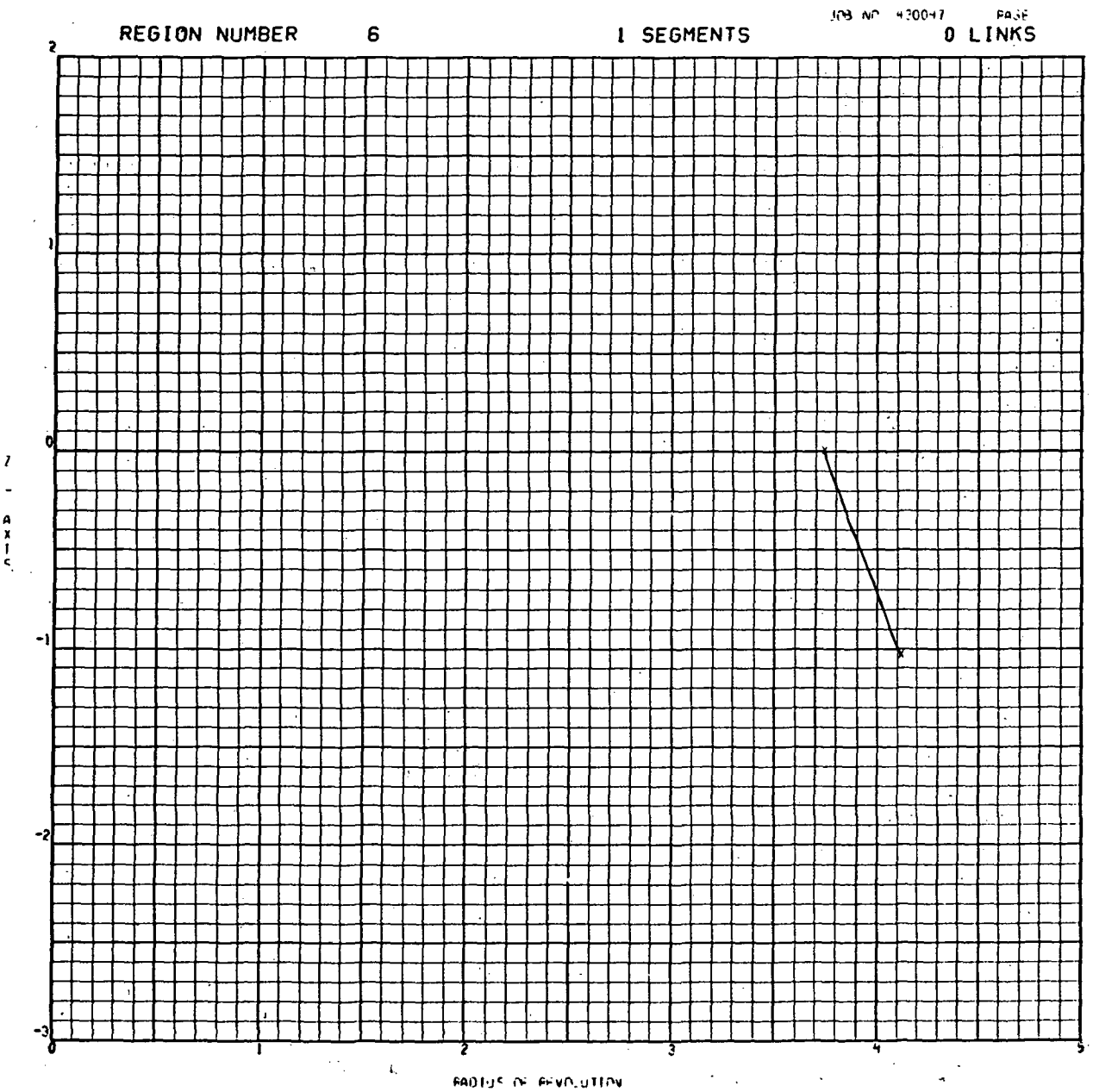

REGION NUMBER 3
1 SEGMENTS
0 LINKS
1.2
1.0
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0


JOB NO 430047 PAGE 4
REGION NUMBER 4
1 SEGMENTS
0 LINKS
1.2
0.8
0.4
0
-0.4
-0.8
-1.2
-1.6
-2.0
Z - AXIS
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
RADIUS OF REVOLUTION

REGION NUMBER 5 1 SEGMENTS 0 LINKS



152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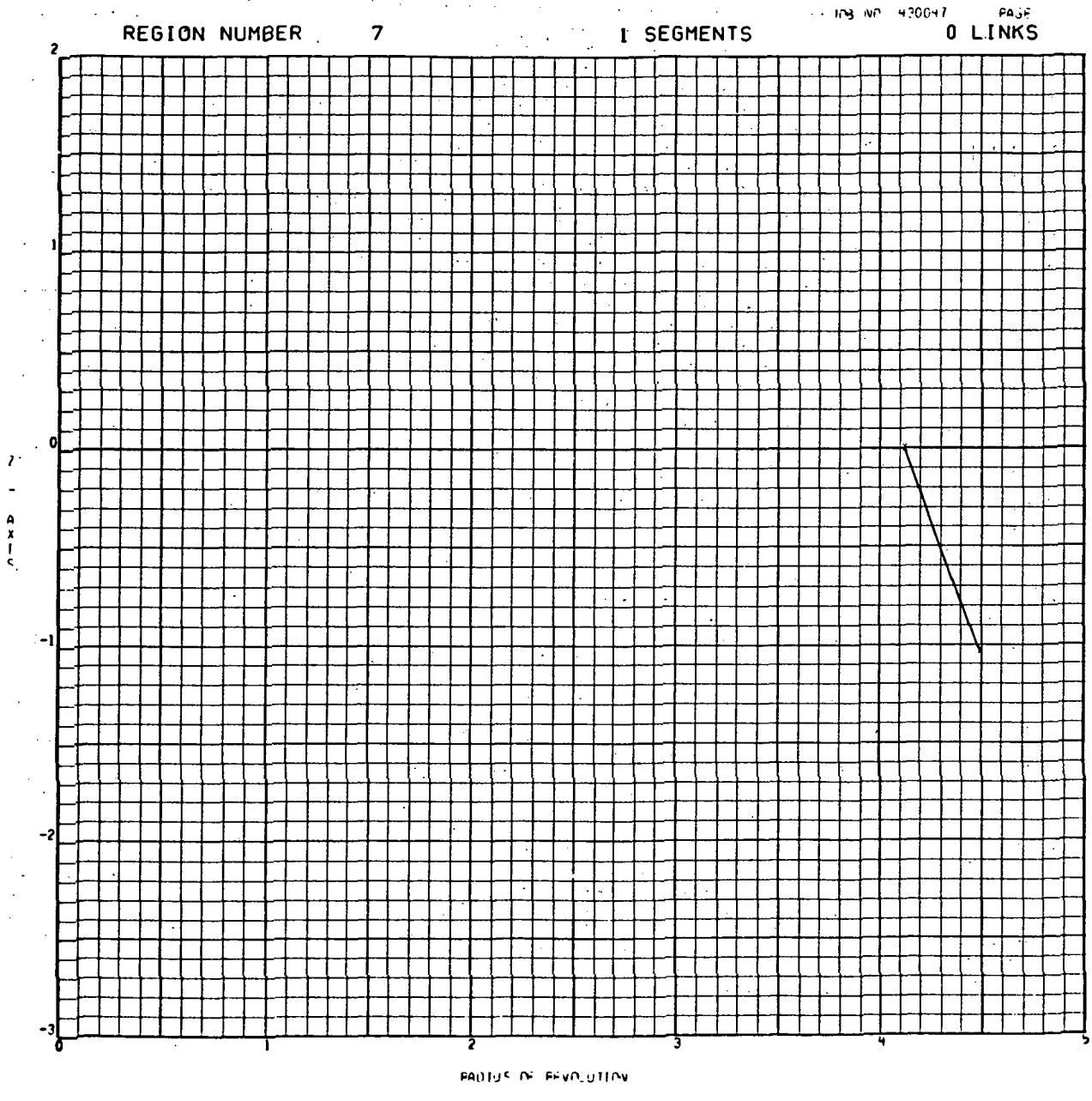
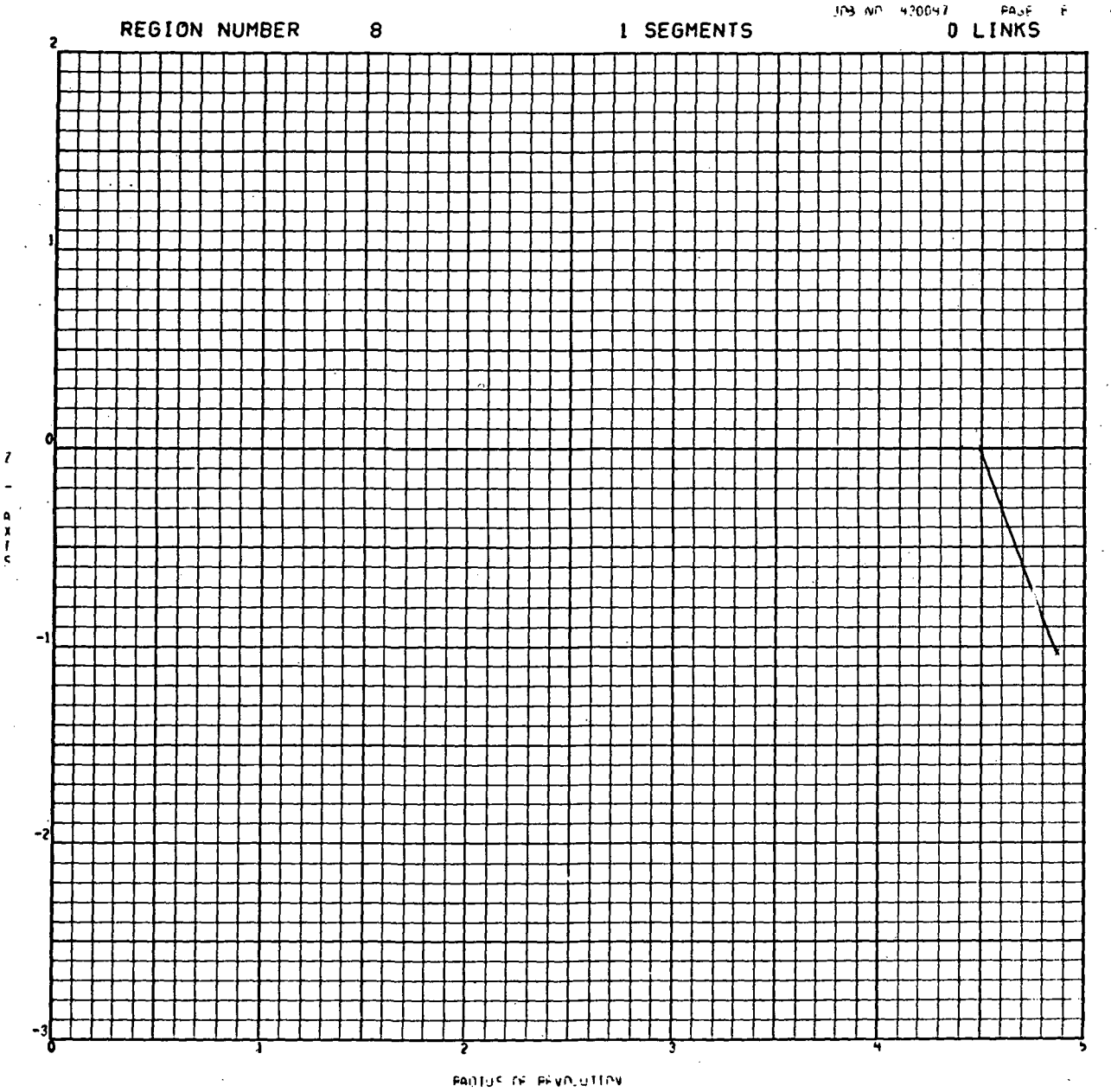
PAGE
REGION NUMBER 6
1 SEGMENTS
0 LINKS
2
1
0
-1
-2
-3
0
1
2
3
4
5
Z - AXIS
RADIUS OF REVOLUTION


REGION NUMBER 7
1 SEGMENTS
0 LINKS
Z - AXIS
RADIUS OF REVOLUTION


JOB NO 420047 PAGE F
REGION NUMBER 8
1 SEGMENTS
0 LINKS
2
1
0
-1
-2
-3
0
1
2
3
4
5
Z - AXIS
RADIUS OF REVOLUTION

The listing of the SAT-1V program follows. The flow charts for this program are the same as for the SAT-1B program discussed previously.

```
RUN,//T STARSS,430047,KEYJØHBIN214,1,500
ASG,T PUR,T,SAVE05
FREE TPF$.
ASG,T TPF$,F/1/PØS/10
FØR,IS BLDATA,BLDATA
      BLØCK DATA                                                        100010
      CØMMØN /NAM1/ FACE(4),STRGØ(7),THERM(4),MATER(3),SEGTAB(12)       100020
      DATA FACE/4HSING,4HEQUA,4HUNEQ,4HBLAN/                            100030
      DATA STRGØ/11.0,13.0,21.0,31.0,12.0,14.0,15.0/                    100040
      DATA THERM/4HTHST,4HNØTH,4HTHCN,4HTHIN/                           100050
      DATA MATER/4HISØT,4HØRTH,4HSTIF/                                  100060
      DATA SEGTAB/4HST10,4HTHIC,4HRWAF,4HRWA1,4HRWA2,4HRWA3,4HISG1,     100070
     1            4HISG2,4HISG3,4HST11,4HST12,4HST13/                   100080
      END                                                               100090
FØR,IS MAIN,MAIN
C                                                                       200010
C     ****************************************************************  200020
C     *                                                              *  200030
C     *                          SATELLITE-1V                        *  200040
C     *                                                              *  200050
C     *                     DATA DEBUGGING PRØGRAM                   *  200060
C     *                           FØR                                *  200070
C     *                      STARS-2V (VIBRATIØN)                    *  200080
C     *                                                              *  200090
C     ****************************************************************  200100
C                                                                       200110
      INTEGER SAVJTC,SAVSTP,SEGTAB,THICK,TYPE                           200120
      INTEGER XN1,XN2,XN                                                200130
      CØMMØN /NAM1/ FACE(4),STRGØ(7),THERM(4),MATER(3),SEGTAB(12)       200140
      CØMMØN/GRAPHS/STIC(30),STP(30),GG1(30),GG2(30),GG3(30),           200150
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NSKL    200160
     2JJT(30),IJT(30)                                                   200170
      CØMMØN /GPLØT/ ZZ(600),RRAD(600),NPT,NZR,DX                       200180
      CØMMØN /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,       200190
     1                PØLY(10),NCØEF                                    200200
      CØMMØN NERRØR,ICØUNT                                              200210
      DIMENSIØN XDUM(6),JCHK(30)                                        200220
      DIMENSIØN XMAT(110,10),STD(10),NXMAT(20),LST(61),ST(70,31)        200230
      DIMENSIØN DLP(4),DUM(20)                                          200240
      DIMENSIØN NRZN(30),ZJ(14,30),RJ(14,30)                            200250
      DIMENSIØN ANGL(30),AWØRD(6)
      EQUIVALENCE (DUM(1),D)                                            200270
      DATA DLIMTR/4H----/,A/1HA/,B/1HB/                                 200280
      DATA AWØRD/-FREV-,-VPRE-,-CRSP-,-PCRS-,-CRSR-,-PCSR-/
2000 FØRMAT(20A4)                                                       200290
2001 FØRMAT(1X,20A4)                                                    200300
      IREGC = 1                                                         200310
    1 READ(5,1999,END=555) DX,DUM                                       200320
1999 FØRMAT(60X,F10.0,T1,20A4)                                          200330
      WRITE(6,1901)                                                     200340
1901 FØRMAT(1H1,20(/),60X,12HSATELLITE-1V////45X,43HSTARS-2V (VIBRATIØN 200350
     1) DATA DEBUGGING PRØGRAM////51X,31HVERSIØN DATE   NØVEMBER 1, 1972 200360
     2, 28(/),80X,35HFØR INFØRMATIØN CALL   V. SVALBØNAS/117X,14H(516) 5 200370
     375-7701/103X,10HP. ØGILVIE)                                       200380
      WRITE(6,1726)                                                     200390
1726 FØRMAT(1H1)                                                        200400
      NIX = 0                                                           200410
      ICØUNT = 0                                                        200420
      WRITE(6,2001) DUM                                                 200440
      READ(5,1002) NREG,NSMAX,NMPT,XN1,XN2,INC,NPRØB,NBC,IBEGIN,IDET,   200450
     1             CØNV,EIGCØN,C,CC,FMLT,ØMEGA,DUM                      200460
```

```
1002 FØRMAT(I2,I3,6I2,2X,2I2,5F7.0,E14.7,T1,20A4)                       200470
     WRITE(6,2001) DUM                                                  200480
     READ(5,1008) WØRD,DUM                                              200490
1008 FØRMAT(A4,T1,20A4)                                                 200500
     WRITE(6,2001) DUM                                                  200510
     DØ 1500 J=1,6
     IF(AWØRD(J)-WØRD)1500,1501,1500
1500 CØNTINUE
1501 IWØRD=J
     IF (IDET.EQ.1) WRITE(6,1302)                                       200520
1302 FØRMAT(/48X,-NØTE - BASIC EIGENVALUE CALCULATIØNS WILL BE PERFØRME 200530
    1D BY DETERMINANT EVALUATIØN.-/)                                    200540
     IF (IDET.EQ.0) WRITE(6,1303)                                       200550
1303 FØRMAT(/48X,-NØTE - BASIC EIGENVALUE CALCULATIØNS WILL BE PERFØRME 200560
    1D BY HØUSEHØLDER METHØD.-/)                                        200570
     NLCASE = NPRØB
     XN = 0
     JNBC = IABS(NBC)                                                   200600
     NRØW = 0                                                           200610
     KK = -1                                                            200620
     NSAVE = 0                                                          200630
     DØ 13 I=1,NMPT                                                     200640
     KK = KK+2                                                          200650
     NXMAT(KK) = NRØW+1                                                 200660
     II = NRØW+1                                                        200670
     READ(5,1004) STD(I),TYPE,DUM                                       200680
1004 FØRMAT(2(A4,6X),T1,20A4)                                           200690
     WRITE(6,2001) DUM                                                  200700
     NRØW = 11                                                          200710
     DØ 11 L=1,3                                                        200720
  11 IF (TYPE.EQ.MATER(L)) GØ TØ 12                                     200730
     NERRØR = 1                                                         200740
     CALL ETRAP                                                         200750
     STD(I) = DLIMTR                                                    200760
     WRITE(6,223)                                                       200770
 223 FØRMAT(28X,103H*   DUE TØ INPUT ERRØR IT IS IMPØSSIBLE TØ CHECK TH 200780
    1E FØLLØWING CARDS UP TØ THE DASH-SEPARATØR CARD.   */)             200790
     GØ TØ 2                                                            200800
  12 CØNTINUE                                                           200810
     IF (L.EQ.1) NRØW = 4
     IF (L.EQ.2) NRØW = 7
     LLL = NSAVE+NRØW                                                   200840
     READ(5,1005) ((XMAT(M,J),J=1,10),M=II,LLL)                         200850
1005 FØRMAT(5E14.7)                                                     200860
     WRITE(6,1205) ((XMAT(M,J),J=1,10),M=II,LLL)                        200870
1205 FØRMAT(1X,5E14.7)                                                  200880
     DØ 608 M=3,10                                                      200890
     IF (XMAT(II,M-1).LT.XMAT(II,M)) GØ TØ 608                          200900
     IF (XMAT(II,M).EQ.0.0) GØ TØ 608                                   200910
     NERRØR = 32                                                        200920
     CALL ETRAP                                                         200930
     STD(I) = D                                                         200940
 608 CØNTINUE                                                           200950
     NRØW = NSAVE+NRØW                                                  200960
     NXMAT(KK+1) = LLL                                                  200970
  13 NSAVE = NRØW                                                       200980
   2 READ(5,2000) DUM                                                   200990
     WRITE(6,2001) DUM                                                  201000
     IF (D.NE.DLIMTR) GØ TØ 2                                           201010
     WRITE(6,222)                                                       201020
 222 FØRMAT(/)                                                          201030
```

```
      DØ 99 NRC=1,NREG                                                    201040
      READ(5,1003) NST,NKL,NRING,DUM                                      201050
 1003 FØRMAT(3I2,T1,20A4)                                                 201060
      WRITE(6,2001) DUM                                                   201070
      IF (NRING.LE.28) GØ TØ 214                                          201080
      NERRØR = 37                                                         201090
      CALL ETRAP                                                          201100
      WRITE(6,996) NRC                                                    201110
  996 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,-    *-///)                    201120
  214 CØNTINUE                                                            201130
      READ(5,1006) JRTIC,JRSTØP,DUM                                       201140
 1006 FØRMAT(5X,2I5,T1,20A4)                                              201150
      WRITE(6,2001) DUM                                                   201160
      NSEG = NST                                                          201170
      NSC = 0                                                             201180
  101 NSC = NSC+1                                                         201190
      NCHK = 0                                                            201200
      READ(5,1011) RGØ,ANG,DUM                                            201210
 1011 FØRMAT(F2.0,A1,T1,20A4)                                             201220
      WRITE(6,2001) DUM                                                   201230
C     GEØMETRY IDENTIFICATIØN SEARCH                                      201240
      DØ 504 I=1,7                                                        201250
  504 IF (RGØ.EQ.STRGØ(I)) GØ TØ 505                                      201260
      NERRØR = 2                                                          201270
      NCHK = 1                                                            201280
      CALL ETRAP                                                          201290
      WRITE(6,999) NRC,NSC                                                201300
      I = 8                                                               201310
  505 KGEØM = I                                                           201320
      MGEØM(NSC) = KGEØM                                                  201330
      IF (KGEØM.EQ.5) WRITE(6,1233)                                       201340
 1233 FØRMAT(/60X,-NØTE - FØR PLØT RØUTINE A/B=1.5, N=0 WILL BE USED.-/)  201350
      IF (RGØ.NE.14.0) GØ TØ 280                                          201360
      ANGL(NSC) = ANG                                                     201370
      IF (ANG.EQ.A.ØR.ANG.EQ.B) GØ TØ 280                                 201380
      NERRØR = 2                                                          201390
      NCHK = 1                                                            201400
      CALL ETRAP                                                          201410
      WRITE(6,999) NRC,NSC                                                201420
  280 CØNTINUE                                                            201430
      READ(5,1012) DTAU,DIFF,STEP,DELTA,DUM                               201440
 1012 FØRMAT(3E14.1,28X,F2.0,T1,20A4)                                     201450
      WRITE(6,2001) DUM                                                   201460
      IF (RGØ.EQ.14.0) GØ TØ 180                                          201470
      READ(5,1015) G1,G2,G3,DUM                                           201480
 1015 FØRMAT(3E14.1,T1,20A4)                                              201490
      WRITE(6,2001) DUM                                                   201500
      GG1(NSC) = G1                                                       201510
      GG2(NSC) = G2                                                       201520
      GG3(NSC) = G3                                                       201530
      GØ TØ 188                                                           201540
  180 READ(5,182) NRZIN,(ZI(J),RI(J),J=1,3),ZI(4),DUM                     201550
  182 FØRMAT(I2,7F10.0,T1,20A4)                                           201560
      NRZN(NSC) = NRZIN                                                   201570
      IF (NRZIN.LE.14) GØ TØ 181                                          201580
      WRITE(6,2001) DUM                                                   201590
      NERRØR = 39                                                         201600
      NCHK = 1                                                            201610
      CALL ETRAP                                                          201620
      WRITE(6,223)                                                        201630
      GØ TØ 3                                                             201640
```

```
  181 IF (NRZIN.LE.3) GØ TØ 185                                          201650
      IF (NRZIN.EQ.4) READ(5,186) RI(4)                                  201660
  186 FØRMAT(7F10.0)                                                     201670
      IF (NRZIN.GT.4) READ(5,186) RI(4),(ZI(J),RI(J),J=5,NRZIN)          201680
  185 CØNTINUE                                                           201690
      WRITE(6,183) NRZIN,(ZI(J),RI(J),J=1,NRZIN)                         201700
  183 FØRMAT(1X,I2,7F10.4/(1X,7F10.4))                                   201710
      DØ 190 J=1,NRZIN                                                   201720
      ZJ(J,NSC) = ZI(J)                                                  201730
  190 RJ(J,NSC) = RI(J)                                                  201740
  188 CØNTINUE                                                           201750
      READ(5,1013) TYPE,HLAYR,SHEET,INTERP,RANKIN,TEFREE,NP,DUM          201760
 1013 FØRMAT(5(A4,6X),E10.1,10X,I2,T1,20A4)                              201770
      WRITE(6,2001) DUM                                                  201780
      ICHK = 0                                                           201790
C     MATERIAL PRØPERTY IDENTIFICATIØN                                   201800
      DØ 501 I=1,NMPT                                                    201810
  501 IF (HLAYR.EQ.STD(I)) GØ TØ 502                                     201820
      NERRØR = 4                                                         201830
      CALL ETRAP                                                         201840
      WRITE(6,999) NRC,NSC                                               201850
      ICHK = 2                                                           201860
      I = NMPT+1                                                         201870
  502 MAT = I                                                            201880
      DØ 506 I=1,3                                                       201890
  506 IF (TYPE.EQ.MATER(I)) GØ TØ 507                                    201900
      NERRØR = 5                                                         201910
      CALL ETRAP                                                         201920
      WRITE(6,999) NRC,NSC                                               201930
      I = 4                                                              201940
  507 ITYPE = I                                                          201950
      DØ 510 I=1,12                                                      201960
  510 IF (INTERP.EQ.SEGTAB(I)) GØ TØ 511                                 201970
      NERRØR = 6                                                         201980
      CALL ETRAP                                                         201990
      WRITE(6,999) NRC,NSC                                               202000
      ICHK = 1                                                           202010
      I = 13                                                             202020
  511 ISTTAB = I                                                         202030
      KLUE2 = 1                                                          202040
      IF (ISTTAB.GE.3.AND.ISTTAB.LE.6) KLUE2 = 2                         202050
      DØ 508 I=1,4                                                       202060
  508 IF (SHEET.EQ.FACE(I)) GØ TØ 509                                    202070
      NERRØR = 7                                                         202080
      CALL ETRAP                                                         202090
      WRITE(6,999) NRC,NSC                                               202100
      ICHK = 1                                                           202110
      I = 5                                                              202120
  509 THICK = I                                                          202130
C     TEMPERATURE LØAD IDENTIFICATIØN                                    202140
      DØ 401 I=1,4                                                       202150
  401 IF (RANKIN.EQ.THERM(I)) GØ TØ 402                                  202160
      NERRØR = 8                                                         202170
      CALL ETRAP                                                         202180
      WRITE(6,999) NRC,NSC                                               202190
      I = 5                                                              202200
  402 KELVIN = I                                                         202210
      IF (NP.GE.2.AND.NP.LE.30) GØ TØ 191                                202220
      NERRØR = 3                                                         202230
      NCHK = 1                                                           202240
      CALL ETRAP                                                         202250
```

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      WRITE(6,999) NRC,NSC                                                  202260
  999 FØRMAT(/5X,-*    REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,-    *-   202270
     1       ///)                                                          202280
      WRITE(6,223)                                                          202290
      GØ TØ 3                                                               202300
  191 CØNTINUE                                                              202310
      IF (ICHK.EQ.1) WRITE(6,223)                                           202320
      IF (ICHK.EQ.1) GØ TØ 3                                                202330
      NRØW = 3                                                              202340
      IF (THICK.GT.1) NRØW = THICK+3                                        202350
      IF (ISTTAB.EQ.1) NRØW = 17                                            202360
      IF (ISTTAB.EQ.3) NRØW = 19                                            202370
      IF (ISTTAB.EQ.4) NRØW = 10                                            202380
      IF (ISTTAB.EQ.5) NRØW = 12                                            202390
      IF (ISTTAB.EQ.6) NRØW = 13                                            202400
      IF (ISTTAB.EQ.7) NRØW = 9                                             202410
      IF (ISTTAB.EQ.8) NRØW = 11                                            202420
      IF (ISTTAB.EQ.9) NRØW = 12                                            202430
      IF (ISTTAB.EQ.10) NRØW = 15                                           202440
      IF (ISTTAB.EQ.11) NRØW = 17                                           202450
      IF (ISTTAB.EQ.12) NRØW = 18                                           202460
      DØ 901 I=1,NRØW                                                      202470
      READ(5,1005) (ST(I,J),J=1,NP)                                         202480
      WRITE(6,1205) (ST(I,J),J=1,NP)                                        202490
  901 CØNTINUE                                                              202500
      STIC(NSC) = ST(1,1)                                                   202510
      STP(NSC) = ST(1,NP)                                                   202520
      IF (G1.EQ.0.0.AND.KGEØM.EQ.3) GØ TØ 902                               202530
      GØ TØ 903                                                             202540
  902 S = ST(1,1)/ST(1,NP)                                                  202550
      IF (0.01.LT.S.AND.S.LT.100.0) GØ TØ 903                               202560
      NERRØR = 33                                                           202570
      CALL ETRAP                                                            202580
      WRITE(6,998) NRC,NSC,LL                                               202590
  903 CØNTINUE                                                              202600
      DØ 2108 LL=1,NP                                                       202610
      HØ = 1.0                                                              202620
      T = 1.0                                                               202630
      GØ TØ (711,600,711,32,33,34,32,33,34,28,29,30),ISTTAB                 202640
  600 GØ TØ (701,702,703),THICK                                             202650
  703 HØ = ST(4,LL)                                                         202660
  702 T = ST(3,LL)                                                          202670
  701 HI = ST(2,LL)                                                         202680
      GØ TØ 714                                                             202690
  711 CØNTINUE                                                              202700
      XK11 = ST(2,LL)                                                       202710
      XK12 = ST(3,LL)                                                       202720
      XK22 = ST(4,LL)                                                       202730
      XK33 = ST(5,LL)                                                       202740
      XD11 = ST(6,LL)                                                       202750
      XD12 = ST(7,LL)                                                       202760
      XD22 = ST(8,LL)                                                       202770
      XD33 = ST(9,LL)                                                       202780
      XK21 = XK12                                                           202790
      XD21 = XD12                                                           202800
      GØ TØ 814                                                             202810
   34 HØ = ST(9,LL)                                                         202820
   33 T = ST(8,LL)                                                          202830
   32 HI = ST(7,LL)                                                         202840
      SPH = ST(5,LL)                                                        202850
      IF (SPH.NE.0.0) GØ TØ 714                                             202860
```

```
      NERRØR = 9                                                        202870
      CALL ETRAP                                                        202880
      WRITE(6,998) NRC,NSC,LL                                           202890
      GØ TØ 714                                                         202900
   30 HØ = ST(14,LL)                                                    202910
   29 T = ST(13,LL)                                                     202920
   28 HI = ST(12,LL)                                                    202930
      SPH = ST(10,LL)                                                   202940
      STH = ST(11,LL)                                                   202950
      IF (STH.NE.0.0) GØ TØ 850                                         202960
      NERRØR = 10                                                       202970
      CALL ETRAP                                                        202980
      WRITE(6,998) NRC,NSC,LL                                           202990
  850 IF (SPH.NE.0.0) GØ TØ 714                                         203000
      NERRØR = 11                                                       203010
      CALL ETRAP                                                        203020
      WRITE(6,998) NRC,NSC,LL                                           203030
  714 CØNTINUE                                                          203040
      IF (HØ.NE.0.0) GØ TØ 802                                          203050
      NERRØR = 12                                                       203060
      CALL ETRAP                                                        203070
      WRITE(6,998) NRC,NSC,LL                                           203080
  802 IF (T.NE.0.0) GØ TØ 801                                           203090
      NERRØR = 13                                                       203100
      CALL ETRAP                                                        203110
      WRITE(6,998) NRC,NSC,LL                                           203120
  801 IF (HI.NE.0.0) GØ TØ 814                                          203130
      IF (ISTTAB.EQ.6.ØR.ISTTAB.EQ.9.ØR.ISTTAB.EQ.12.ØR.(ISTTAB.EQ.2.AND 203140
     1.THICK.EQ.3)) GØ TØ 710                                           203150
      NERRØR = 14                                                       203160
      GØ TØ 712                                                         203170
  710 NERRØR = 15                                                       203180
  712 CALL ETRAP                                                        203190
      WRITE(6,998) NRC,NSC,LL                                           203200
  814 CØNTINUE                                                          203210
      IF (ITYPE.NE.3) GØ TØ 2108                                        203220
      IF (ISTTAB.NE.1.AND.ISTTAB.NE.3) GØ TØ 2108                       203230
      IF (XK11.NE.0.0) GØ TØ 2101                                       203240
      NERRØR = 16                                                       203250
      CALL ETRAP                                                        203260
      WRITE(6,998) NRC,NSC,LL                                           203270
 2101 IF (XK12.NE.0.0) GØ TØ 2104                                       203280
      NERRØR = 17                                                       203290
      CALL ETRAP                                                        203300
      WRITE(6,998) NRC,NSC,LL                                           203310
 2104 IF (XK21.NE.0.0) GØ TØ 2105                                       203320
      NERRØR = 18                                                       203330
      CALL ETRAP                                                        203340
      WRITE(6,998) NRC,NSC,LL                                           203350
 2105 IF (XK22.NE.0.0) GØ TØ 2106                                       203360
      NERRØR = 19                                                       203370
      CALL ETRAP                                                        203380
      WRITE(6,998) NRC,NSC,LL                                           203390
 2106 IF (XK33.NE.0.0) GØ TØ 2109                                       203400
      NERRØR = 20                                                       203410
      CALL ETRAP                                                        203420
      WRITE(6,998) NRC,NSC,LL                                           203430
 2109 IF (XD11.NE.0.0) GØ TØ 2110                                       203440
      NERRØR = 21                                                       203450
      CALL ETRAP                                                        203460
      WRITE(6,998) NRC,NSC,LL                                           203470
```

```
2110 IF (XD12.NE.0.0) GØ TØ 2102                                        203480
     NERRØR = 22                                                        203490
     CALL ETRAP                                                         203500
     WRITE(6,998) NRC,NSC,LL                                            203510
2102 IF (XD21.NE.0.0) GØ TØ 2103                                        203520
     NERRØR = 23                                                        203530
     CALL ETRAP                                                         203540
     WRITE(6,998) NRC,NSC,LL                                            203550
2103 IF (XD22.NE.0.0) GØ TØ 2107                                        203560
     NERRØR = 24                                                        203570
     CALL ETRAP                                                         203580
     WRITE(6,998) NRC,NSC,LL                                            203590
2107 IF (XD33.NE.0.0) GØ TØ 2108                                        203600
     NERRØR = 25                                                        203610
     CALL ETRAP                                                         203620
     WRITE(6,998) NRC,NSC,LL                                            203630
2108 CØNTINUE                                                           203640
     NLCS=NLCASE
     IF(IWØRD.GE.3) NLCS=NLCASE-1
     IF (NLCS.LE.0) GØ TØ 590
     K = NRØW+1                                                         203660
     JJ = 1                                                             203670
     JJJ = 6                                                            203680
     MM = 1                                                             203690
     LST(7) = 0                                                         203700
     DØ 17 NLC=1,NLCS
     JT = JJ                                                            203720
     JTT = JJJ                                                          203730
     L = 0                                                              203740
     READ(5,1014) (LST(J),J=JJ,JJJ),DUM                                 203750
1014 FØRMAT(6I1,T1,20A4)                                                203760
     WRITE(6,2001) DUM                                                  203770
     IF (LST(JJ)) 8031,19,20                                            203780
  20 L = LST(JJ)                                                        203790
     IF (LST(1).EQ.0.ØR.LST(JT).EQ.0) GØ TØ 1026                        203800
     IF (NLC.EQ.1) GØ TØ 1026                                           203810
     NERRØR = 26                                                        203820
     CALL ETRAP                                                         203830
     WRITE(6,999) NRC,NSC                                               203840
1026 IF ((LST(1).NE.1.AND.LST(JT).NE.1).AND.(KELVIN.EQ.3.ØR.KELVIN.EQ.4 203850
    1)) GØ TØ 1027                                                      203860
     GØ TØ 1028                                                         203870
1027 NERRØR = 35                                                        203880
     CALL ETRAP                                                         203890
     WRITE(6,999) NRC,NSC                                               203900
1028 IF ((LST(1).NE.4.AND.LST(JT).NE.4).AND.KELVIN.EQ.1) GØ TØ 1029     203910
     GØ TØ 1025                                                         203920
1029 NERRØR = 35                                                        203930
     CALL ETRAP                                                         203940
     WRITE(6,999) NRC,NSC                                               203950
1025 IF (L.NE.1.AND.L.NE.4) GØ TØ 8031                                  203960
     GØ TØ 19                                                           203970
8031 NERRØR = 27                                                        203980
     CALL ETRAP                                                         203990
     WRITE(6,999) NRC,NSC                                               204000
     WRITE(6,223)                                                       204010
     GØ TØ 3                                                            204020
  19 JJ = JJ+1                                                          204030
     IF (L.NE.0.AND.KELVIN.EQ.2) GØ TØ 8075                             204040
     GØ TØ 23                                                           204050
8075 NERRØR = 35                                                        204060
```

```
      CALL ETRAP                                                        204070
      WRITE(6,999) NRC,NSC                                              204080
   23 IF (LST(JJ)) 8032,22,21                                           204090
   21 L = L+1                                                           204100
      IF (LST(JJ).NE.1) GØ TØ 8032                                      204110
   22 IF (JJ.EQ.JJJ) GØ TØ 24                                           204120
      JJ = JJ+1                                                         204130
      GØ TØ 23                                                          204140
 8032 NERRØR = 27                                                       204150
      CALL ETRAP                                                        204160
      WRITE(6,999) NRC,NSC                                              204170
      WRITE(6,223)                                                      204180
      GØ TØ 3                                                           204190
   24 IF (L.EQ.0) GØ TØ 71                                              204200
      IF (ICHK.EQ.2.AND.LST(JJ-5).NE.0) WRITE(6,223)                    204210
      LY = K                                                            204220
      KK = K+L-1                                                        204230
      DØ 72 M=K,KK                                                      204240
      READ(5,1005) (ST(M,J),J=1,NP)                                     204250
      WRITE(6,1205) (ST(M,J),J=1,NP)                                    204260
   72 CØNTINUE                                                          204270
      IF (LST(JT).EQ.0) GØ TØ 71                                        204280
      K = K+LST(1)                                                      204290
   71 K = K+L-LST(JT)                                                   204300
      JJ = JJJ+1                                                        204310
      JJJ = JJ+5                                                        204320
   17 MM = MM+1                                                         204330
  590 CØNTINUE                                                          204340
      READ(5,591) IS,SAVJTC,SAVSTP,DUM                                  204350
  591 FØRMAT(3I5,T1,20A4)                                               204360
      WRITE(6,2001) DUM                                                 204370
      IJT(NSC) = SAVJTC                                                 204380
      JJT(NSC) = SAVSTP                                                 204390
C     THE UPDATED INTERPØLATED VALUES ØF THE MATERIAL PRØPERTY CØEFFIC  204400
C     IENTS ARE FØUND IN THE XMAT TABLE AND STØRED IN THE XLAYER ARRAY  204410
      IF (LST(1).EQ.0.AND.LST(7).EQ.0) GØ TØ 3                          204420
      IF (ICHK.EQ.2) GØ TØ 3                                            204430
      IF (KELVIN.NE.5) GØ TØ 125                                        204440
      IF (LST(1).EQ.1.ØR.LST(7).EQ.1) KELVIN = 3                        204450
      IF (LST(1).EQ.4.ØR.LST(7).EQ.4) KELVIN = 1                        204460
  125 CØNTINUE                                                          204470
      DØ 123 LL=1,NP                                                    204480
      L=(MAT-1)*2+1                                                     204490
      II=NXMAT(L)                                                       204500
       III=NXMAT(L+1)                                                   204510
      M=1                                                               204520
      GØ TØ (91,123,93,93),KELVIN                                       204530
   91 TEMPAV = (ST(LY,LL)+ST(LY+1,LL)+ST(LY+2,LL)+ST(LY+3,LL))/4.0      204540
      ARG=TEMPAV                                                        204550
      GØTØ 94                                                           204560
   93 ARG = ST(NRØW + 1,LL)                                             204570
   94 DØ 104 I = 2,10                                                   204580
      IF (ARG-XMAT(II,I)) 121,123,104                                   204590
  121 IF (I-2) 8007,8007,123                                            204600
 8007 NERRØR = 28                                                       204610
      CALL ETRAP                                                        204620
      WRITE(6,998) NRC,NSC,LL                                           204630
  998 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,5X,    204640
     1       -SEGMENT GEØMETRY TABLE ITEM -,I2,-   *-///)               204650
      GØ TØ 123                                                         204660
  104 CØNTINUE                                                          204670
```

```
      NERRØR = 29                                                       204680
      CALL ETRAP                                                        204690
      WRITE(6,998) NRC,NSC,LL                                           204700
  123 CØNTINUE                                                          204710
    3 READ(5,2000) DUM                                                  204720
      WRITE(6,2001) DUM                                                 204730
      IF (D.NE.DLIMTR) GØ TØ 3                                          204740
      WRITE(6,222)                                                      204750
      JCHK(NSC) = NCHK                                                  204760
      IF (NSC.LT.NSEG) GØ TØ 101                                        204770
      NSC = 0                                                           204780
      IF (NRING.EQ.0) GØ TØ 210                                         204790
      DØ 211 I=1,NRING                                                  204800
      READ(5,720) JTNØ,(XDUM(J),J=1,5),DUM                              204810
  720 FØRMAT(I2,5E14.7,T1,20A4)                                         204820
      WRITE(6,2001) DUM                                                 204830
      READ(5,721) XDUM,DUM                                              204840
  721 FØRMAT(6E12.5,T1,20A4)                                            204850
      WRITE(6,2001) DUM                                                 204860
      IF (XDUM(2)) 780,780,781                                          204870
  780 WRITE(6,782)                                                      204880
  782 FØRMAT(/  4X,-THE RING CENTRØID RADIUS IS ZERØ.-/)                 204890
      IC0UNT = IC0UNT+1                                                 204900
  781 CØNTINUE                                                          204910
      READ(5,722) (XDUM(J),J=1,5),DUM                                   204920
  722 FØRMAT(5E14.7,T1,20A4)                                            204930
      WRITE(6,2001) DUM
      READ(5,723)(XDUM(J),J=1,4),DUM
  723 FØRMAT(4E14.7,T1,20A4)
  211 WRITE(6,2001) DUM                                                 204940
  680 READ(5,2000) DUM                                                  204950
      WRITE(6,2001) DUM                                                 204960
      IF (D.NE.DLIMTR) GØ TØ 680                                        204970
      WRITE(6,222)                                                      204980
  210 CØNTINUE                                                          204990
      NSKL = NKL                                                        205000
      IF (NSKL.EQ.0) GØ TØ 95                                           205010
      DØ 103 NRIG=1,NSKL                                                205020
      READ(5,503) JDEP,JIND,ANGLE,DUM                                   205030
  503 FØRMAT(2I2,E14.7,T1,20A4)                                         205040
      WRITE(6,2001) DUM                                                 205050
      JLINK(NRIG) = JDEP                                                205060
      ILINK(NRIG) = JIND                                                205070
      ANGLNK(NRIG) = ANGLE                                              205080
      IF (JIND.LT.JDEP) GØ TØ 103                                       205090
      NERRØR = 30                                                       205100
      CALL ETRAP                                                        205110
  103 CØNTINUE                                                          205120
    4 READ(5,2000) DUM                                                  205130
      WRITE(6,2001) DUM                                                 205140
      IF (D.NE.DLIMTR) GØ TØ 4                                          205150
      WRITE(6,222)                                                      205160
   95 NSEG = NST                                                        205170
      NLINK = NKL                                                       205180
      DØ 3030 ISEG = 1,NSEG                                             205190
      NCHK = JCHK(ISEG)                                                 205200
      KSEG = ISEG                                                       205210
      IF (MGEØM(ISEG).NE.6) GØ TØ 195                                   205220
      ANG = ANGL(ISEG)                                                  205230
      NRZIN = NRZN(ISEG)                                                205240
      IF (NRZIN.GE.15) GØ TØ 195                                        205250
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      DØ 192 I=1,NRZIN                                                  205260
      ZI(I) = ZJ(I,ISEG)                                                205270
  192 RI(I) = RJ(I,ISEG)                                                205280
  195 CØNTINUE                                                          205290
      CALL GRAPH (NCHK,NRC)                                             205300
      IF (NCHK.EQ.1) GØ TØ 3031                                         205310
 3030 CØNTINUE                                                          205320
 3031 NZR = NRC                                                         205330
      JCLUE = 0                                                         205340
      IF (NCHK.EQ.1.AND.KSEG.EQ.1) JCLUE = 1                            205350
      IF (NCHK.EQ.1.AND.KSEG.GT.1) JCLUE = 2                            205360
      CALL ZPLØT (JCLUE)                                                205370
   99 CØNTINUE                                                          205380
      READ(5,601) NØJ,NØRING,NLINK,DUM                                  205390
  601 FØRMAT(3I5,T1,20A4)                                               205400
      WRITE(6,2001) DUM                                                 205410
      IF (NØRING.LE.28) GØ TØ 750                                       205420
      NERRØR = 38                                                       205430
      CALL ETRAP                                                        205440
  750 CØNTINUE                                                          205450
      IF (NØRING.EQ.0) GØ TØ 751                                        205460
      DØ 752 I=1,NØRING                                                 205470
      READ(5,720) JTNØ,(XDUM(J),J=1,5),DUM                              205480
      WRITE(6,2001) DUM                                                 205490
      READ(5,721) XDUM,DUM                                              205500
      WRITE(6,2001) DUM                                                 205510
      IF (XDUM(2)) 783,783,784                                          205520
  783 WRITE(6,782)                                                      205530
      ICØUNT = ICØUNT+1                                                 205540
  784 CØNTINUE                                                          205550
      READ(5,722) (XDUM(J),J=1,5),DUM                                   205560
  752 WRITE(6,2001) DUM                                                 205570
  681 READ(5,2000) DUM                                                  205580
      WRITE(6,2001) DUM                                                 205590
      IF (D.NE.DLIMTR) GØ TØ 681                                        205600
      WRITE(6,222)                                                      205610
  751 CØNTINUE                                                          205620
      IF (NLINK.EQ.0) GØ TØ 3108                                        205630
      DØ 602 NRIG=1,NLINK                                               205640
      READ(5,603) JD,JI,CØTAN,DUM                                       205650
  603 FØRMAT(2I2,E14.7,T1,20A4)                                         205660
      WRITE(6,2001) DUM                                                 205670
      LST(NRIG) = JD                                                    205680
      IF (NRIG.EQ.1) GØ TØ 605                                          205690
      IF (JDD.LT.JD) GØ TØ 605                                          205700
      NERRØR = 31                                                       205710
      CALL ETRAP                                                        205720
      IF (JDD.GE.JD) GØ TØ 602                                          205730
  605 JDD = JD                                                          205740
  602 CØNTINUE                                                          205750
    5 READ(5,2000) DUM                                                  205760
      WRITE(6,2001) DUM                                                 205770
      IF (D.NE.DLIMTR) GØ TØ 5                                          205780
      WRITE(6,222)                                                      205790
 3108 CØNTINUE                                                          205800
      DØ 109 J=1,NØJ                                                    205810
      READ(5,110) JN,DLP,ANGLE,DUM                                      205820
  110 FØRMAT(I2,4F2.0,E14.1,T1,20A4)                                    205830
      WRITE(6,2001) DUM                                                 205840
      IF (NLINK.EQ.0) GØ TØ 109                                         205850
      DØ 130 N=1,NLINK                                                  205860
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      IF (JN.EQ.LST(N)) GØ TØ 132                                       205870
  130 CØNTINUE                                                          205880
      GØ TØ 109                                                         205890
  132 DØ 131 I=1,4                                                      205900
      IF (DLP(I).EQ.0.0) GØ TØ 131                                      205910
      NERRØR = 34                                                       205920
      CALL ETRAP                                                        205930
      GØ TØ 109                                                         205940
  131 CØNTINUE                                                          205950
  109 CØNTINUE                                                          205960
    6 READ(5,2000) DUM                                                  205970
      WRITE(6,2001) DUM                                                 205980
      IF (D.NE.DLIMTR) GØ TØ 6                                          205990
      WRITE(6,222)                                                      206000
      IF(IWØRD.EQ.3.ØR.IWØRD.EQ.5.ØR.IWØRD.EQ.1) GØ TØ 303
      READ(5,302) LINLØD,DUM                                            206020
  302 FØRMAT(I4,T1,20A4)                                                206030
      WRITE(6,2001) DUM                                                 206040
      IF (LINLØD.EQ.0) GØ TØ 7                                          206050
      DØ 304 N=1,LINLØD                                                 206060
      READ(5,305) JEXT2,JEXT1,XFL,DUM                                   206070
  305 FØRMAT(2I5,E14.7,T1,20A4)                                         206080
      WRITE(6,2001) DUM                                                 206090
  304 CØNTINUE                                                          206100
    7 READ(5,2000) DUM                                                  206110
      WRITE(6,2001) DUM                                                 206120
      IF (D.NE.DLIMTR) GØ TØ 7                                          206130
      WRITE(6,222)                                                      206140
  303 CØNTINUE                                                          206150
      LNBC = JNBC-1                                                     206160
      IF (LNBC.EQ.0) GØ TØ 888                                          206170
      DØ 320 I=1,LNBC                                                   206180
      GØ 310 J=1,NØJ                                                    206190
      READ(5,110) JN,DLP,ANGLE,DUM                                      206200
      WRITE(6,2001) DUM                                                 206210
      IF (NLINK.EQ.0) GØ TØ 310                                         206220
      DØ 312 N=1,NLINK                                                  206230
      IF (JN.EQ.LST(N)) GØ TØ 313                                       206240
  312 CØNTINUE                                                          206250
      GØ TØ 310                                                         206260
  313 DØ 314 N=1,4                                                      206270
      IF (DLP(N).EQ.0.0) GØ TØ 314                                      206280
      NERRØR = 34                                                       206290
      CALL ETRAP                                                        206300
      GØ TØ 310                                                         206310
  314 CØNTINUE                                                          206320
  310 CØNTINUE                                                          206330
    8 READ(5,2000) DUM                                                  206340
      WRITE(6,2001) DUM                                                 206350
      IF (D.NE.DLIMTR) GØ TØ 8                                          206360
      WRITE(6,222)                                                      206370
  320 CØNTINUE                                                          206380
  888 IF (ICØUNT.EQ.0) GØ TØ 889                                        206390
      WRITE(6,866) ICØUNT                                               206400
  866 FØRMAT(10(/),10ØX,I5,- ERRØRS LØCATED.-)                          206410
      GØ TØ 1                                                           206420
  889 WRITE(6,865)                                                      206430
  865 FØRMAT(10(/),10ØX,-NØ DETECTABLE ERRØRS FØUND.-)                  206440
      GØ TØ 1                                                           206450
  555 CALL ENDJØB
      STØP                                                              206470
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      END                                                               206480
FØR,IS GRAPH,GRAPH
      SUBRØUTINE GRAPH (NCHK,NRC)                                       300010
      CØMMØN/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),              300020
     1IREGC,ISEG ,NSEG,MGEØM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,  300030
     2JJT(30),IJT(30)                                                   300040
      CØMMØN/GPLØT/ZZ(600),RRAD(600),NPT,NZR                            300050
      CØMMØN /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,       300060
     1               PØLY(10),NCØEF                                     300070
      CØMMØN NERRØR                                                     300080
      DIMENSIØN PHI(20),RAD(20),Z(20)
      DIMENSIØN IDARY(2)
      DIMENSIØN R(3),ZE(9)                                              300100
      DATA IDARY/-HARDCØ-,-PY     -/
      DATA AAA/-A    -/                                                 300110
      DØ 600 I=1,20                                                     300120
      RAD(I) = 0.0                                                      300130
  600 Z(I) = 0.0                                                        300140
      IF(ISEG .NE.1)GØ TØ 20                                            300150
      NPT=0                                                             300160
      RELØR = 0.0                                                       300170
      IF(IREGC .NE.1)GØ TØ 20                                           300180
      CALL IDENT (9,IDARY)
      IREGC = 2                                                         300200
   20 IF (NCHK.EQ.1) GØ TØ 999                                          300210
      MG = MGEØM(ISEG)                                                  300220
      GØ TØ (30,30,80,70,30,30,160,999),MG                              300230
   30 CØNTINUE                                                          300240
      DELTA=(STP(ISEG)-STIC(ISEG))/19.0                                 300250
      DØ 50 I = 1,19                                                    300260
      PHI(I)= (I-1)*DELTA + STIC(ISEG)                                  300270
   50 CØNTINUE                                                          300280
      PHI(20)= STP(ISEG)                                                300290
   60 GØ TØ(100,90,80,70,130,120,160),MG                                300300
C                                                                       300310
C     CYLINDER                                                          300320
C                                                                       300330
   70 CØNTINUE                                                          300340
      NUMPT= 2                                                          300350
      RAD(1) = G1(ISEG)                                                 300360
      RAD(2) = RAD(1)                                                   300370
      Z(1) = STP(ISEG)-STIC(ISEG)                                       300380
      Z(2)= 0.0                                                         300390
      GØ TØ 200                                                         300400
C                                                                       300410
C     CØNE                                                              300420
C                                                                       300430
   80 CØNTINUE                                                          300440
      PHIANG= G1(ISEG)                                                  300450
      CØSP= CØS(PHIANG)                                                 300460
      RAD(1)= STIC(ISEG)* CØSP                                          300470
      RAD(2)= STP(ISEG)* CØSP                                           300480
      Z(1)= SIN(PHIANG)*(STP(ISEG)-STIC(ISEG))                          300490
      Z(2)= 0.0                                                         300500
      NUMPT = 2                                                         300510
      GØ TØ 200                                                         300520
C                                                                       300530
C     ØGIVE                                                             300540
C                                                                       300550
   90 CØNTINUE                                                          300560
      CØSP= CØS(STP(ISEG))                                              300570
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      DØ 95 I=1,20                                                      300580
      RAD(I)= (G1(ISEG)*SIN(PHI(I))) - G2(ISEG)                         300590
      Z(I)= G1(ISEG)*(CØS(PHI(I))-CØSP)                                 300600
   95 CØNTINUE                                                          300610
      Z(20)= 0.0                                                        300620
      NUMPT =20                                                         300630
      GØ TØ 200                                                         300640
C                                                                       300650
C     ELIPSE-(G3 IS ØFFSET DISTANCE)                                    300660
C                                                                       300670
  100 CØNTINUE                                                          300680
      BB= G2(ISEG)                                                      300690
      C= G3(ISEG)                                                       300700
      A= G1(ISEG)                                                       300710
      B= G2(ISEG)* A                                                    300720
      DØ 109 I=1,20                                                     300730
      CØSP= CØS(PHI(I))                                                 300740
      SINP= SIN(PHI(I))                                                 300750
      RAD(I) = SINP*A/((SINP**2+BB**2*CØSP**2)**.5)-C                   300760
      Z(I) = B*SQRT(1.0-(RAD(I)+C)**2/A**2)                             300770
      IF (PHI(I).GT.1.5708.AND.PHI(I).LT.4.61239) Z(I) = -Z(I)          300780
  109 CØNTINUE                                                          300790
      DØ 107 I=1,20                                                     300800
  107 Z(I) = Z(I)-Z(20)                                                 300810
      NUMPT = 20                                                        300820
      GØ TØ 200                                                         300830
C                                                                       300840
C     GENERAL GEØMETRY                                                  300850
C                                                                       300860
  120 CØNTINUE                                                          300870
      CALL GEØMET                                                       300880
      DØ 450 K=1,20                                                     300890
      ARG = PHI(K)                                                      300900
      DØ 404 J=1,100                                                    300910
      PHØ = PSI(J)                                                      300920
      IF (ANG.EQ.AAA) IF (ARG-PHØ) 421,423,404                          300930
      IF (PHØ-ARG) 421,423,404                                          300940
  421 IF (J-1) 8502,8502,424                                            300950
  404 CØNTINUE                                                          300960
      GØ TØ 8503                                                        300970
  423 RAD(K) = RADR(J)                                                  300980
      GØ TØ 450                                                         300990
 8502 NERRØR = 56                                                       301000
      CALL ETRAP                                                        301010
      WRITE(6,989) NRC,ISEG                                             301020
  989 FØRMAT(/5X,-*   REGIØN NUMBER -,I2,5X,-SEGMENT NUMBER -,I2,-    *- 301030
     1       ///)                                                       301040
      NCHK = 1                                                          301050
      GØ TØ 999                                                         301060
 8503 NERRØR = 57                                                       301070
      CALL ETRAP                                                        301080
      WRITE(6,989) NRC,ISEG                                             301090
      NCHK = 1                                                          301100
      GØ TØ 999                                                         301110
  424 SUB1 = ARG-PSI(J-1)                                               301120
      SUB2 = PSI(J)-PSI(J-1)                                            301130
      RAD(K) = RADR(J-1)+(RADR(J)-RADR(J-1))*SUB1/SUB2                  301140
  450 CØNTINUE                                                          301150
      RMAX = RI(1)                                                      301160
      RMIN = RI(1)                                                      301170
      DØ 365 K=2,NRZIN                                                  301180
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      IF (RI(K).LT.RMIN) RMIN = RI(K)                                   301190
      IF (RI(K).GT.RMAX) RMAX = RI(K)                                   301200
  365 CØNTINUE                                                          301210
      DØ 401 J=1,20                                                     301220
      IF (RAD(J).LT.RMIN) RAD(J) = RMIN                                 301230
      IF (RAD(J).GT.RMAX) RAD(J) = RMAX                                 301240
  401 CØNTINUE                                                          301250
      P1 = 3.1415926/2.0                                                301260
      P3 = 3.0*P1                                                       301270
      DØ 449 J=1,20                                                     301280
      PHØ = PHI(J)                                                      301290
      IF (PHØ.LT.P1.ØR.PHØ.GT.P3) GØ TØ 353                             301300
      AA = RI(1)                                                        301310
      III = 1                                                           301320
      C = AA                                                            301330
      I = III                                                           301340
      JJ = 1                                                            301350
      DØ 451 K=2,NRZIN                                                  301360
      IF (ANG.EQ.AAA) IF (RAD(J)-RI(K)) 350,360,452                     301370
      IF (RI(K)-RAD(J)) 350,360,452                                     301380
  350 C = RI(K)                                                         301390
      I = K                                                             301400
      JJ = I                                                            301410
  451 CØNTINUE                                                          301420
  452 D = RI(K)                                                         301430
      II = K                                                            301440
      JJJ = II                                                          301450
      IF (I.NE.1) GØ TØ 460                                             301460
      AA = RI(K+1)                                                      301470
      III = K+1                                                         301480
      R(1) = C                                                          301490
      R(2) = D                                                          301500
      R(3) = AA                                                         301510
      ZE(4) = ZI(I)                                                     301520
      ZE(5) = ZI(II)                                                    301530
      ZE(6) = ZI(III)                                                   301540
      GØ TØ 480                                                         301550
  460 CØNTINUE                                                          301560
      AA = RI(K-2)                                                      301570
      III = K-2                                                         301580
      R(1) = AA                                                         301590
      R(2) = C                                                          301600
      R(3) = D                                                          301610
      ZE(4) = ZI(III)                                                   301620
      ZE(5) = ZI(I)                                                     301630
      ZE(6) = ZI(II)                                                    301640
      GØ TØ 480                                                         301650
  353 AA = RI(NRZIN)                                                    301660
      III = NRZIN                                                       301670
      C = A                                                             301680
      I = III                                                           301690
      JJ = NRZIN                                                        301700
      L = NRZIN-1                                                       301710
      K = L                                                             301720
      DØ 453 M=1,L                                                      301730
      IF (ANG.EQ.AAA) IF (RAD(J)-RI(K)) 349,360,454                     301740
      IF (RI(K)-RAD(J)) 349,360,454                                     301750
  349 C = RI(K)                                                         301760
      I = K                                                             301770
      JJ = I                                                            301780
      K = K-1                                                           301790
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  453 CØNTINUE                                                          301800
  454 D = RI(K)                                                         301810
      II = K                                                            301820
      JJJ = II                                                          301830
      IF (I.NE.NRZIN) GØ TØ 470                                         301840
      AA = RI(K-1)                                                      301850
      III = K-1                                                         301860
      R(1) = C                                                          301870
      R(2) = D                                                          301880
      R(3) = AA                                                         301890
      ZE(4) = ZI(I)                                                     301900
      ZE(5) = ZI(II)                                                    301910
      ZE(6) = ZI(III)                                                   301920
      GØ TØ 480                                                         301930
  470 CØNTINUE                                                          301940
      AA = RI(K+2)                                                      301950
      III = K+2                                                         301960
      R(1) = AA                                                         301970
      R(2) = C                                                          301980
      R(3) = D                                                          301990
      ZE(4) = ZI(III)                                                   302000
      ZE(5) = ZI(I)                                                     302010
      ZE(6) = ZI(II)                                                    302020
  480 CØNTINUE                                                          302030
      ZE(1) = ZE(4)*ZE(4)                                               302040
      ZE(2) = ZE(5)*ZE(5)                                               302050
      ZE(3) = ZE(6)*ZE(6)                                               302060
      ZE(7) = 1.0                                                       302070
      ZE(8) = 1.0                                                       302080
      ZE(9) = 1.0                                                       302090
      IF (PHØ.GE.P1.AND.PHØ.LE.P3) GØ TØ 370                            302100
      ITMP = JJ                                                         302110
      JJ = JJJ                                                          302120
      JJJ = ITMP                                                        302130
  370 CØNTINUE                                                          302140
      CALL SIMQ (ZE,R)                                                  302150
      AA = R(1)                                                         302160
      BB = R(2)                                                         302170
      CC = R(3)                                                         302180
      DISC = BB*BB-4.0*AA*(CC-RAD(J))                                   302190
      IF (DISC.LT.0.0) GØ TØ 8777                                       302200
      Z1 = (-BB+SQRT(DISC))/(2.0*AA)                                    302210
      Z2 = (-BB-SQRT(DISC))/(2.0*AA)                                    302220
      IF (Z1.GE.ZI(JJ).AND.Z1.LE.ZI(JJJ)) Z(J) = Z1                     302230
      IF (Z2.GE.ZI(JJ).AND.Z2.LE.ZI(JJJ)) Z(J) = Z2                     302240
      GØ TØ 449                                                         302250
 8777 WRITE(6,8778) J                                                   302260
 8778 FØRMAT(//- FØR J =-,I3,- THE RØØTS ARE IMAGINARY-)                302270
      GØ TØ 449                                                         302280
  360 Z(J) = ZI(K)                                                      302290
  449 CØNTINUE                                                          302300
      NUMPT = 20                                                        302310
      GØ TØ 200                                                         302320
C                                                                       302330
C     MØDIFIED ELIPSE                                                   302340
C                                                                       302350
  130 CØNTINUE                                                          302360
      A = G2(ISEG)                                                      302370
      DØ 110 I=1,20                                                     302380
      CØSP = COS(PHI(I))                                                302390
      SINP = SIN(PHI(I))                                                302400
```

```
      SINP1 = 1.0/(SINP+1.0)                                            302410
      RAD(I) = 2.0*A*SINP*SINP1                                         302420
  110 Z(I) = 2.0*A*C0SP*(2.0-SINP1)/(3.0*(SINP+1.0))                    302430
      D0 111 I=1,20                                                     302440
  111 Z(I) = Z(I)-Z(20)                                                 302450
      NUMPT = 20                                                        302460
      G0 T0 200                                                         302470
C                                                                       302480
C     DUMMY GE0METRY                                                    302490
C                                                                       302500
  160 C0NTINUE                                                          302510
  200 C0NTINUE                                                          302520
      IF(ISEG .NE.1)G0 T0 220                                           302530
      IF(JJT(I) .GT. IJT(I))G0 T0 230                                   302540
      G0 T0 250                                                         302550
  220 CALL KLINK(IRET,LNKNUM)                                           302560
      G0 T0 (230,250,230,250),IRET                                      302570
C                                                                       302580
C     C0NNECTED AT ITH-J0INT                                            302590
C                                                                       302600
  230 C0NTINUE                                                          302610
      Z1 = Z(1)                                                         302620
      D0 240 I=1,NUMPT                                                  302630
      Z(I) = Z(I) - Z1                                                  302640
  240 C0NTINUE                                                          302650
      G0 T0 270                                                         302660
C                                                                       302670
C     C0NNECTED AT J-J0INT                                              302680
C                                                                       302690
  250 INDX= NUMPT/2                                                     302700
      D0 260 I=1,INDX                                                   302710
      K= NUMPT+1-I                                                      302720
      TEMPZ= Z(I)                                                       302730
      TEMPR= RAD(I)                                                     302740
      Z(I)= Z(K)                                                        302750
      RAD(I)=RAD(K)                                                     302760
      Z(K)= TEMPZ                                                       302770
      RAD(K)= TEMPR                                                     302780
  260 C0NTINUE                                                          302790
C                                                                       302800
C     ADD LAST RELATIVE 0RIGIN                                          302810
C                                                                       302820
  270 D0 280 I=1,NUMPT                                                  302830
      Z(I) = Z(I)+REL0R                                                 302840
  280 C0NTINUE                                                          302850
      REL0R = Z(NUMPT)                                                  302860
      IF(ISEG .EQ.1)G0 T0 300                                           302870
      G0 T0 (300,300,290,290),IRET                                      302880
C                                                                       302890
C     KINEMATIC LINK AT THIS J0INT-ADJUST Z-C00RDINATE                  302900
C                                                                       302910
  290 DZ=(RAD(1)-RAD0LD)* C0TAN(ANGLNK(LNKNUM))                         302920
      D0 295 I=1,NUMPT                                                  302930
      Z(I)= Z(I) + DZ                                                   302940
  295 C0NTINUE                                                          302950
      D = C0TAN(ANGLNK(LNKNUM))                                         302960
  300 RAD0LD=RAD(NUMPT)                                                 302970
      REL0R = Z(NUMPT)                                                  302980
      D0 310 I=1,NUMPT                                                  302990
      RRAD( I+NPT)= RAD(I)                                              303000
      ZZ(  I+NPT) = Z(I)                                                303010
```

```
  310 CONTINUE                                                          303020
      NPT=NPT+NUMPT                                                     303030
  999 RETURN                                                            303040
      END                                                               303050
FOR,IS KLINK,KLINK
      SUBROUTINE KLINK(IRET,LNKNUM)                                     400010
      COMMON/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),              400020
     1IREGC,ISEG ,NSEG,MGEOM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,   400030
     2JJT(30),IJT(30)                                                   400040
      ISEGC = ISEG                                                      400050
      IF(IJT(ISEGC).EQ. IJT(ISEGC-1).OR.IJT(ISEGC).EQ.JJT(ISEGC-1))     400060
     1GO TO 10                                                          400070
      IF(JJT(ISEGC).NE. IJT(ISEGC-1).AND. JJT(ISEGC).NE.JJT(ISEGC-1))   400080
     1GO TO 30                                                          400090
C     CONNECTED AT J-JOINT                                              400100
      IRET= 2                                                           400110
      GO TO 100                                                         400120
C     CONNECTED AT I-TH JOINT                                           400130
   10 IRET= 1                                                           400140
      GO TO 100                                                         400150
C                                                                       400160
C     IS THERE A KINEMATIC LINK                                         400170
C                                                                       400180
   30 DO 50 I=1,NLINK                                                   400190
      IF(IJT(ISEGC).EQ. JLINK(I))GO TO 40                               400200
      IF(JJT(ISEGC).NE. JLINK(I))GO TO 50                               400210
      IRET= 4                                                           400220
      GO TO 45                                                          400230
   40 IRET=3                                                            400240
   45 LNKNUM= I                                                         400250
      GO TO 100                                                         400260
   50 CONTINUE                                                          400270
      WRITE(6,60)                                                       400280
   60 FORMAT(/,1X,-***-ERROR-UNCONNECTED JOINT BETWEEN SEGMENTS- )      400290
      STOP                                                              400300
  100 RETURN                                                            400310
      END                                                               400320
FOR,IS ZPLOT,ZPLOT
      SUBROUTINE ZPLOT (JCLUE)
      COMMON/GRAPHS/STIC(30),STP(30),G1(30),G2(30),G3(30),
     1IREGC,ISEG ,NSEG,MGEOM(30),JLINK(30),ILINK(30),ANGLNK(30),NLINK,
     2JJT(30),IJT(30)
      COMMON /GPLOT/ ZZ(600),RRAD(600),NPT,NZR,DX
      DIMENSION YTITLE(12),XTITLE(12)
      DIMENSION TITLE(12)
      DIMENSION ALPHA(3)
      EXTERNAL TABLIV
      DATA YTITLE/-Z - AX-,-IS     -,10*6H       /
      DATA XTITLE/-RADIUS-,- OF RE-,-VOLUTI-,-ON     -,8*6H       /
      DATA TITLE/-      R-,-EGION -,-NUMBER-,-       -,-       -,-       -,
     1           -       -,- SEGME-,-NTS    -,-       -,-       -,- LINKS-/
      CALL CHSIZV (2,2)
      CALL RITSTV (13,19,TABLIV)
C
      DS = DX
      IF (JCLUE.EQ.1) GO TO 200
      YMIN = ZZ(1)
      YMAX = ZZ(1)
      XMIN = 0.0
      XMAX = RRAD(1)
      DO 400 J=2,NPT
```

```
      IF (ZZ(J).LE.YMIN) YMIN = ZZ(J)
      IF (ZZ(J).GT.YMAX) YMAX = ZZ(J)
      IF (RRAD(J).GT.XMAX) XMAX = RRAD(J)
  400 CONTINUE
      IF (DX.NE.0.0) GO TO 500
      DX = XMAX-XMIN
      DV = YMAX-YMIN
      IF (DV.LT.DX) DV = DX
      GO TO 600
  500 DV = DX
  600 CONTINUE
      YDIF = (YMAX-YMIN)/2.0+YMIN
      YMIN = YDIF-DV/2.0
      YMAX = YDIF+DV/2.0
      XDIF = (XMAX-XMIN)/2.0+XMIN
      XMIN = XDIF-DV/2.0
      XMAX = XDIF+DV/2.0
      CALL SCRND (XMAX,XMIN,XMX,XMN)
      CALL SCRND (YMAX,YMIN,YMX,YMN)
      CALL QUIK3L (-1,XMN,XMX,YMN,YMX,1HX,XTITLE,YTITLE,-NPT,RRAD,ZZ)
  200 IF (JCLUE.EQ.1) CALL FRAMEV (2)
      ENCODE (801,ALPHA) NZR,NSEG,NLINK
  801 FORMAT(3I6)
      TITLE(4) = ALPHA(1)
      TITLE(7) = ALPHA(2)
      TITLE(11) = ALPHA(3)
      CALL RITE2V (46,1005,1023,90,1,72,1,TITLE,IERR)
      IF (JCLUE.EQ.0) GO TO 99
      CALL CHSIZV (9,9)
      CALL RITSTV (48,68,TABLIV)
      I = 100
      J = 900
      CALL RITE2V (I,J,1023,90,1,6,1,6HDUE TO,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,5,1,5HINPUT,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,5,1,5HERROR,IERR)
      IF (JCLUE.EQ.1) GO TO 100
      J = J-100
      CALL RITE2V (I,J,1023,90,1,11,1,11HTHE REST OF,IERR)
  100 J = J-100
      CALL RITE2V (I,J,1023,90,1,11,1,11HTHIS REGION,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,6,1,6HIS NOT,IERR)
      J = J-100
      CALL RITE2V (I,J,1023,90,1,9,1,9HGRAPHABLE,IERR)
   99 CONTINUE
      DX = DS
      RETURN
      END
 FOR,IS GEOMET,GEOMET
      SUBROUTINE GEOMET                                                 600010
C     THIS SUBROUTINE CALCULATES THE GEOMETRY FOR A SHELL SEGMENT.      600020
C     THE INPUT VARIABLES ARE . . .                                     600030
C             RI(I) - - DISTANCE FROM AXIS OF REV. TO POINTS            600040
C                       ON SHELL MERIDIAN.                              600050
C             ZI(I) - - DISTANCE ALONG AXIS OF REV. TO THE              600060
C                       INTERSECTION OF THE CORRESPONDING RI(I) AND     600070
C                       THE AXIS OF REV.                                600080
C             NRZIN - - NUMBER OF (RI,ZI) PAIRS READ AS INPUT.          600090
C                                                                       600100
```

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      COMMON /SPLINS/ ANG,PSI(100),RADR(100),ZI(14),RI(14),NRZIN,          600110
     1                POLY(10),NCOEF                                       600120
      DIMENSION CI(4,13),DRDZ(14),SOUT(14),S(101),RADD(100)                600130
C                                                                          600140
      FUN(ARG) = SQRT(1.0 + ARG**2)                                        600150
C                                                                          600160
      RADS = 3.1415926/180.0                                               600170
      DATA B/-B   -/                                                       600180
      AMULT = 1.0                                                          600190
      IF (ANG.EQ.B) AMULT = -1.0                                           600200
C                                                                          600210
C     PASS SPLINE CURVE THROUGH INPUT POINTS ON SHELL MERIDIAN, AND        600220
C     COMPUTE DR/DZ AT THESE POINTS.                                       600230
C                                                                          600240
      CALL PLICO (ZI,RI,NRZIN,CI)                                          600250
      NDELZ = NRZIN - 1                                                    600260
      DO 60 I=1,NRZIN                                                      600270
      CALL PLINE (ZI,RI,NRZIN,CI,ZI(I),FAKE1,DRDZ(I),FAKE2)                600280
   60 CONTINUE                                                             600290
C                                                                          600300
C     COMPUTE MERIDIONAL ARC LENGTH TO INTERPOLATED POINTS BY              600310
C     NUMERICAL INTEGRATION (SIMPSONS RULE).  SINCE SIMPSONS RULE          600320
C     REQUIRES AN EVEN NUMBER OF PARTITIONS, INTERPOLATE A POINT           600330
C     MIDWAY BETWEEN EACH PAIR OF POINTS USING SUBROUTINE SPLINE.          600340
C                                                                          600350
      SOUT(1) = 0.                                                         600360
      DO 70 I=1,NDELZ                                                      600370
      DZ2=(ZI(I+1)-ZI(I))/2.0                                              600380
      DZ6=DZ2/3.0                                                          600390
      CALL PLINE (ZI,RI,NRZIN,CI,ZI(I)+DZ2,FAKE1,DRDZM,FAKE2)              600400
      SOUT(I+1) = SOUT(I) + DZ6*(FUN(DRDZ(I)) + 4.0*FUN(DRDZM) +           600410
     1            FUN(DRDZ(I+1)))                                          600420
   70 CONTINUE                                                             600430
C                                                                          600440
C     USE SPLICO TO REPRESENT RI(I) AS A FUNCTION OF SOUT(I).  THEN USE    600450
C     SPLINE TO INTERPOLATE RADD.                                          600460
C                                                                          600470
      OLDH1 = SOUT(NRZIN)/99.0                                             600480
  100 CALL PLICO (SOUT,RI,NRZIN,CI)                                        600490
      DO 110 I=1,100                                                       600500
      S(I) = FLOAT(I-1)*OLDH1                                              600510
      CALL PLINE (SOUT,RI,NRZIN,CI,S(I),RADR(I),RADD(I),RADD2)             600520
      IF (ABS(RADD(I)).GT.1.0) RADD(I)=1.0                                 600530
  110 CONTINUE                                                             600540
      DO 180 J=1,100                                                       600550
      COSPSI = AMULT*RADD(J)                                               600560
      PSI(J) = ARCOS(COSPSI)                                               600570
      IF (ANG.EQ.B) GO TO 180                                              600580
      PSI(J) = 2.0*3.1415926-PSI(J)                                        600590
  180 CONTINUE                                                             600600
      RETURN                                                               600610
      END                                                                  600620
FOR,IS PLINE,PLINE
      SUBROUTINE PLINE (X,Y,M,C,XINT,YINT,DYDX,D2YDX2)                     700010
C     SUBROUTINE FOR SPLINE FIT INTERPOLATION IN THE TABLE OF VALUES       700020
C     (X1,Y1) TO (XM,YM), WHERE M MAY BE AS LARGE AS 100, WHERE THE        700030
C     CONSTANTS C(1,K),C(2,K),C(3,K) AND C(4,K) ARE ALREADY COMPUTED       700040
C     AND STORED.                                                          700050
C     SUBROUTINE ALSO COMPUTES DY/DX AND D2Y/DX2 AT XINT.                  700060
      DIMENSION X(14),Y(14),C(4,13)                                        700070
      IF (XINT-X(1)) 80,10,20                                              700080
```

```
   10 YINT = Y(1)                                                        700090
      K=1                                                                700100
      GØ TØ 70                                                           700110
   20 K = 1                                                              700120
   30 IF (XINT-X(K+1)) 60,40,50                                          700130
   40 YINT = Y(K+1)                                                      700140
      GØ TØ 70                                                           700150
   50 K = K + 1                                                          700160
      IF (M-K) 80,80,30                                                  700170
   60 YINT = (X(K+1) - XINT)*(C(1,K)*(X(K+1)-XINT)**2+C(3,K))            700180
      YINT = YINT + (XINT-X(K))*(C(2,K)*(XINT-X(K))**2+C(4,K))           700190
   70 DYDX=-3.0*(C(1,K)*(X(K+1)-XINT)**2-C(2,K)*(XINT-X(K))**2)          700200
     1     -C(3,K)+C(4,K)                                                700210
      D2YDX2=6.0*(C(1,K)*(X(K+1)-XINT)+C(2,K)*(XINT-X(K)))               700220
      RETURN                                                             700230
   80 WRITE (6,90)                                                       700240
   90 FØRMAT (31H ØUT ØF RANGE FØR INTERPØLATIØN)                        700250
      RETURN                                                             700260
      END                                                                700270
FØR,IS PLIC0,PLIC0
      SUBRØUTINE PLIC0 (X,Y,M,C)                                         800010
C     SUBRØUTINE TØ DETERMINE C(1,K),C(2,K),C(3,K) AND C(4,K).           800020
      DIMENSIØN X(14),Y(14),A(14,3),B(14),Z(14)                          800030
      DIMENSIØN D(13),P(13),E(13),C(4,13)                                800040
      MM = M-1                                                           800050
      DØ 10 K=1,MM                                                       800060
      D(K) = X(K+1) - X(K)                                               800070
      P(K) = D(K)/6.0                                                    800080
   10 E(K) = (Y(K+1)-Y(K))/D(K)                                          800090
      DØ 20 K=2,MM                                                       800100
   20 B(K) = E(K) - E(K-1)                                               800110
      A(1,2) = -1.0-D(1)/D(2)                                            800120
      A(1,3) = D(1)/D(2)                                                 800130
      A(2,3) = P(2)-P(1)*A(1,3)                                          800140
      A(2,2) = 2.0*(P(1)+P(2)) - P(1)*A(1,2)                             800150
      A(2,3) = A(2,3)/A(2,2)                                             800160
      B(2) = B(2)/A(2,2)                                                 800170
      DØ 30 K=3,MM                                                       800180
      A(K,2) = 2.0*(P(K-1)+P(K))-P(K-1)*A(K-1,3)                         800190
      B(K) = B(K)-P(K-1)*B(K-1)                                          800200
      A(K,3) = P(K)/A(K,2)                                               800210
   30 B(K) = B(K)/A(K,2)                                                 800220
      Q = D(M-2)/D(M-1)                                                  800230
      A(M,1) = 1.0+Q+A(M-2,3)                                            800240
      A(M,2) = -Q-A(M,1)*A(M-1,3)                                        800250
      B(M) = B(M-2)-A(M,1)*B(M-1)                                        800260
      Z(M) = B(M)/A(M,2)                                                 800270
      MN = M-2                                                           800280
      DØ 40 I=1,MN                                                       800290
      K = M-I                                                            800300
   40 Z(K) = B(K)-A(K,3)*Z(K+1)                                          800310
      Z(1) = -A(1,2)*Z(2)-A(1,3)*Z(3)                                    800320
      DØ 50 K=1,MM                                                       800330
      Q = 1.0/(6.0*D(K))                                                 800340
      C(1,K) = Z(K)*Q                                                    800350
      C(2,K) = Z(K+1)*Q                                                  800360
      C(3,K) = Y(K)/D(K)-Z(K)*P(K)                                       800370
   50 C(4,K) = Y(K+1)/D(K)-Z(K+1)*P(K)                                   800380
      RETURN                                                             800390
      END                                                                800400
FØR,IS SIMQ,SIMQ
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```
      SUBRØUTINE SIMQ (A,B)                                          900010
      DIMENSIØN A(1),B(1)                                            900020
C                                                                    900030
C     FØRWARD SØLUTIØN                                               900040
C                                                                    900050
      N = 3                                                          900060
      TØL = 0.0                                                      900070
      KS = 0                                                         900080
      JJ = -N                                                        900090
      DØ 65 J=1,N                                                    900100
      JY = J+1                                                       900110
      JJ = JJ+N+1                                                    900120
      BIGA = 0.0                                                     900130
      IT = JJ-J                                                      900140
      DØ 30 I=J,N                                                    900150
C                                                                    900160
C     SEARCH FØR MAXIMUM CØEFFICIENT IN CØLUMN                       900170
C                                                                    900180
      IJ = IT+I                                                      900190
      IF (ABS(BIGA)-ABS(A(IJ))) 20,30,30                             900200
   20 BIGA = A(IJ)                                                   900210
      IMAX = I                                                       900220
   30 CØNTINUE                                                       900230
C                                                                    900240
C     TEST FØR PIVØT LESS THAN TØLERANCE (SINGULAR MATRIX)           900250
C                                                                    900260
      IF (ABS(BIGA)-TØL) 35,35,40                                    900270
   35 KS = 1                                                         900280
      RETURN                                                         900290
C                                                                    900300
C     INTERCHANGE RØWS IF NECESSARY                                  900310
C                                                                    900320
   40 I1 = J+N*(J-2)                                                 900330
      IT = IMAX-J                                                    900340
      DØ 50 K=J,N                                                    900350
      I1 = I1+N                                                      900360
      I2 = I1+IT                                                     900370
      SAVE = A(I1)                                                   900380
      A(I1) = A(I2)                                                  900390
      A(I2) = SAVE                                                   900400
C                                                                    900410
C     DIVIDE EQUATIØN BY LEADING CØEFFICIENT                         900420
C                                                                    900430
   50 A(I1) = A(I1)/BIGA                                             900440
      SAVE = B(IMAX)                                                 900450
      B(IMAX) = B(J)                                                 900460
      B(J) = SAVE/BIGA                                               900470
C                                                                    900480
C     ELIMINATE NEXT VARIABLE                                        900490
C                                                                    900500
      IF (J-N) 55,70,55                                              900510
   55 IQS = N*(J-1)                                                  900520
      DØ 65 IX=JY,N                                                  900530
      IXJ = IQS+IX                                                   900540
      IT = J-IX                                                      900550
      DØ 60 JX=JY,N                                                  900560
      IXJX = N*(JX-1)+IX                                             900570
      JJX = IXJX+IT                                                  900580
   60 A(IXJX) = A(IXJX)-(A(IXJ)*A(JJX))                              900590
   65 B(IX) = B(IX)-(B(J)*A(IXJ))                                    900600
C                                                                    900610
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C      BACK SØLUTIØN                                                    900620
C                                                                       900630
   70 NY = N-1                                                          900640
      IT = N*N                                                          900650
      DØ 80 J=1,NY                                                      900660
      IA = IT-J                                                         900670
      IB = N-J                                                          900680
      IC = N                                                            900690
      DØ 80 K=1,J                                                       900700
      B(IB) = B(IB)-A(IA)*B(IC)                                         900710
      IA = IA-N                                                         900720
   80 IC = IC-1                                                         900730
      RETURN                                                            900740
      END                                                               900750
FØR,IS ETRAP,ETRAP
      SUBRØUTINE ETRAP                                                 1000010
      CØMMØN NERRØR,ICØUNT                                             1000020
      ICØUNT = ICØUNT+1                                                1000030
      GØ TØ (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22, 1000040
     1       23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39),NERRØR 1000050
    1 WRITE(6,101)                                                     1000060
  101 FØRMAT(/  4X,-ØNE ØF THE MATERIAL PRØPERTY TABLES CANNØT BE IDENTI 1000070
     1FIED AS ISØT, ØRTH, ØR STIF.-/)                                  1000080
      GØ TØ 99                                                         1000090
    2 WRITE(6,102)                                                     1000100
  102 FØRMAT(/  4X,-THE TYPE ØF GEØMETRY ØF A SEGMENT CANNØT BE IDENTIFI 1000110
     1ED AS ØNE HANDLED BY THE PRØGRAM.-/)                             1000120
      GØ TØ 99                                                         1000130
    3 WRITE(6,103)                                                     1000140
  103 FØRMAT(/  4X,-THE NUMBER ØF PØINTS IN THE ST TABLE MUST BE BETWEEN 1000150
     1 2 AND 30.-/)                                                    1000160
      GØ TØ 99                                                         1000170
    4 WRITE(6,104)                                                     1000180
  104 FØRMAT(/  4X,-A MATERIAL PRØPERTY TABLE NAME FØR A SEGMENT CANNØT  1000190
     1BE FØUND IN THE TABLE LIST.-/)                                   1000200
      GØ TØ 99                                                         1000210
    5 WRITE(6,105)                                                     1000220
  105 FØRMAT(/  4X,-THE TYPE ØF MATERIAL PRØPERTY TABLE FØR A SEGMENT CA 1000230
     1NNØT BE IDENTIFIED AS ISØT, ØRTH, ØR STIF.-/)                    1000240
      GØ TØ 99                                                         1000250
    6 WRITE(6,106)                                                     1000260
  106 FØRMAT(/  4X,-THE PRØBLEM INPUT CAN ØNLY BE THIC, RWAF, RWA1, RWA2 1000270
     1, RWA3, ST10, ST11, ST12, ST13, ISG1, ISG2, ØR ISG3.-/)          1000280
      GØ TØ 99                                                         1000290
    7 WRITE(6,107)                                                     1000300
  107 FØRMAT(/  4X,-THE WALL CØNSTRUCTIØN ØF A SEGMENT CANNØT BE IDENTIF 1000310
     1IED AS SING, EQUA, UNEQ, ØR BLAN.-/)                             1000320
      GØ TØ 99                                                         1000330
    8 WRITE(6,108)                                                     1000340
  108 FØRMAT(/  4X,-THE TYPE ØF TEMPERATURE INPUT FØR A SEGMENT CANNØT B 1000350
     1E IDENTIFIED AS THST, NØTH, THCN, ØR THIN.-/)                    1000360
      GØ TØ 99                                                         1000370
    9 WRITE(6,109)                                                     1000380
  109 FØRMAT(/  4X,-THE WAFFLE GRID SPACING IS ZERØ.-/)                1000390
      GØ TØ 99                                                         1000400
   10 WRITE(6,110)                                                     1000410
  110 FØRMAT(/  4X,-THE RING SPACING IS ZERØ.-/)                       1000420
      GØ TØ 99                                                         1000430
   11 WRITE(6,111)                                                     1000440
  111 FØRMAT(/  4X,-THE STRINGER SPACING IS ZERØ.-/)                   1000450
      GØ TØ 99                                                         1000460
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 12 WRITE(6,112)                                                        1000470
112 FØRMAT(/  4X,-THE ØUTSIDE SHEET THICKNESS IS ZERØ.-/)               1000480
    GØ TØ 99                                                            1000490
 13 WRITE(6,113)                                                        1000500
113 FØRMAT(/  4X,-THE CØRE THICKNESS IS ZERØ.-/)                        1000510
    GØ TØ 99                                                            1000520
 14 WRITE(6,114)                                                        1000530
114 FØRMAT(/  4X,-THE SHEET THICKNESS IS ZERØ.-/)                       1000540
    GØ TØ 99                                                            1000550
 15 WRITE(6,115)                                                        1000560
115 FØRMAT(/  4X,-THE INSIDE SHEET THICKNESS IS ZERØ.-/)                1000570
    GØ TØ 99                                                            1000580
 16 WRITE(6,116)                                                        1000590
116 FØRMAT(/  4X,-THE K11 STIFFNESS PARAMETER IS ZERØ.-/)               1000600
    GØ TØ 99                                                            1000610
 17 WRITE(6,117)                                                        1000620
117 FØRMAT(/  4X,-THE K12 STIFFNESS PARAMETER IS ZERØ.-/)               1000630
    GØ TØ 99                                                            1000640
 18 WRITE(6,118)                                                        1000650
118 FØRMAT(/  4X,-THE K21 STIFFNESS PARAMETER IS ZERØ.-/)               1000660
    GØ TØ 99                                                            1000670
 19 WRITE(6,119)                                                        1000680
119 FØRMAT(/  4X,-THE K22 STIFFNESS PARAMETER IS ZERØ.-/)               1000690
    GØ TØ 99                                                            1000700
 20 WRITE(6,120)                                                        1000710
120 FØRMAT(/  4X,-THE K33 STIFFNESS PARAMETER IS ZERØ.-/)               1000720
    GØ TØ 99                                                            1000730
 21 WRITE(6,121)                                                        1000740
121 FØRMAT(/  4X,-THE D11 STIFFNESS PARAMETER IS ZERØ.-/)               1000750
    GØ TØ 99                                                            1000760
 22 WRITE(6,122)                                                        1000770
122 FØRMAT(/  4X,-THE D12 STIFFNESS PARAMETER IS ZERØ.-/)               1000780
    GØ TØ 99                                                            1000790
 23 WRITE(6,123)                                                        1000800
123 FØRMAT(/  4X,-THE D21 STIFFNESS PARAMETER IS ZERØ.-/)               1000810
    GØ TØ 99                                                            1000820
 24 WRITE(6,124)                                                        1000830
124 FØRMAT(/  4X,-THE D22 STIFFNESS PARAMETER IS ZERØ.-/)               1000840
    GØ TØ 99                                                            1000850
 25 WRITE(6,125)                                                        1000860
125 FØRMAT(/  4X,-THE D33 STIFFNESS PARAMETER IS ZERØ.-/)               1000870
    GØ TØ 99                                                            1000880
 26 WRITE(6,126)                                                        1000890
126 FØRMAT(/  4X,-TEMPERATURE CAN ØNLY BE CØNSIDERED IN EITHER THE PRE 1000900
   1BUCKLING STATE ØR AS PART ØF THE BUCKLING LØAD.-/)                  1000910
    GØ TØ 99                                                            1000920
 27 WRITE(6,127)                                                        1000930
127 FØRMAT(/  4X,-THE LØAD INDICATØR CLUES CAN ØNLY BE ZERØ, BLANK, ØN 1000940
   1E, ØR FØUR.-/)                                                      1000950
    GØ TØ 99                                                            1000960
 28 WRITE(6,128)                                                        1000970
128 FØRMAT(/  4X,-THE INTERPØLATED VALUE ØF TEMPERATURE FØR USE IN THE 1000980
   1 MATERIAL PRØPERTY TABLE IS LESS THAN THE SECØND TEMPERATURE VALUE 1000990
   2.-/)                                                                1001000
    GØ TØ 99                                                            1001010
 29 WRITE(6,129)                                                        1001020
129 FØRMAT(/  4X,-THE INTERPØLATED VALUE ØF TEMPERATURE FØR USE IN THE 1001030
   1 MATERIAL PRØPERTY TABLE IS GREATER THAN THE LAST VALUE ØF TEMPERA 1001040
   2TURE.-/)                                                            1001050
    GØ TØ 99                                                            1001060
 30 WRITE(6,130)                                                        1001070
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 130 FØRMAT(/  4X,-FØR KINEMATIC LINKS BETWEEN SEGMENTS, THE DEPENDENT  1001080
    1J0INT NUMBER MUST BE GREATER THAN THE INDEPENDENT J0INT NUMBER.-/) 1001090
      G0 T0 99                                                         1001100
  31 WRITE(6,131)                                                      1001110
 131 FØRMAT(/  4X,-J-TH J0INTS 0N SUCCESSIVE INTER-REGI0N KINEMATIC LIN 1001120
    1K CARDS MUST BE IN INCREASING 0RDER.-/)                           1001130
      G0 T0 99                                                         1001140
  32 WRITE(6,132)                                                      1001150
 132 FØRMAT(/  4X,-TEMPERATURE VALUES (C0LUMNS 2 THRU END) IN THE MATER 1001160
    1IAL PR0PERTY TABLE MUST BE IN INCREASING 0RDER.-/)                1001170
      G0 T0 99                                                         1001180
  33 WRITE(6,133)                                                      1001190
 133 FØRMAT(/  4X,-FØR AN ANNULAR PLATE NEAR THE AXIS 0F REV0LUTI0N, TH 1001200
    1E END P0INT L0CATI0NS SH0ULD BE IN A RATI0 BETWEEN .01 AND 100.-/) 1001210
      G0 T0 99                                                         1001220
  34 WRITE(6,134)                                                      1001230
 134 FØRMAT(/  4X,-DEGREES 0F FREED0M 0F DEPENDENT (J) J0INT 0F KINEMAT 1001240
    1IC LINKS MUST BE --ZER0ED 0UT--.-/)                               1001250
      G0 T0 99                                                         1001260
  35 WRITE(6,135)                                                      1001270
 135 FØRMAT(/  4X,-TEMPERATURE AND L0AD CLUES ARE INC0NSISTENT.-/)     1001280
      G0 T0 99                                                         1001290
  36 WRITE(6,136)                                                      1001300
 136 FØRMAT(/  4X,-THERE CAN 0NLY BE 0NE PR0BLEM IF THE PREBUCKLING STR 1001310
    1ESS STATE IS INPUT.-/)                                            1001320
      G0 T0 99                                                         1001330
  37 WRITE(6,137)                                                      1001340
 137 FØRMAT(/  4X,-THE NUMBER 0F REGI0N RINGS EXCEEDS 28.-/)           1001350
      G0 T0 99                                                         1001360
  38 WRITE(6,138)                                                      1001370
 138 FØRMAT(/  4X,-THE NUMBER 0F STRUCTURE RINGS EXCEEDS 28.-/)        1001380
      G0 T0 99                                                         1001390
  39 WRITE(6,139)                                                      1001400
 139 FØRMAT(/  4X,-THE NUMBER 0F GE0METRY INPUT P0INTS EXCEEDS 14.-/)  1001410
  99 RETURN                                                            1001420
       END                                                             1001430
MAP,IS SYM,STARSS
LIB SYS$*MSFC$.
C0P0UT TPF$.,PUR.
XQT STARSS
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SECTION 5

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